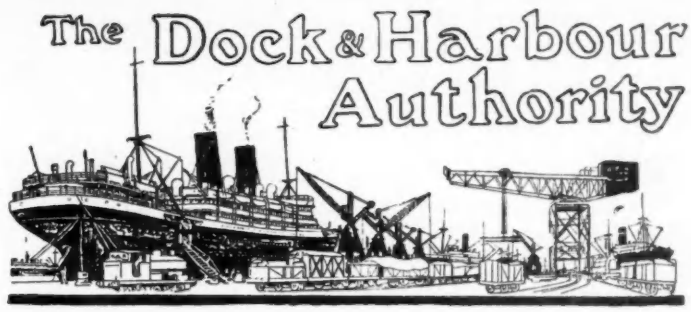
SUBSCRIPTION RATES:

The Annual Subscription, post free, to any part of the world is 21/- (English) or its equivalent in other currency. The price of single copies is 1/6, or 1/9 if sent by post. Back numbers (when available) are charged double if over six months old.

CONTRIBUTIONS:

All Letters and Contributions intended for Publication should be addressed to:—
K. R. DOGGETT, Editor,
"The Dock and Harbour Authority,"
19, Harcourt Street, London, W.1.
Telephone: PADdington 0077/8.



No. 333. Vol. XXIX. JULY, 1948

CONTENTS

Editorial Comments

Centenary Year of the Port of East London.

The growth of the town and port of East London is one of the romances of South Africa. Within a matter of only 100 years there has developed from a primitive and natural state one of the principal industrial and commercial centres of the Union of South Africa, and the only large river port on the South African coast. It was the river mouth which first attracted the attention of Europeans to the spot, and throughout the history of East London, it has been the river that has played the most conspicuous part in its development.

Although a survey of the Buffalo River Mouth was undertaken in 1835, it was not until the following year that the first ship anchored off the river and landed food supplies by means of small boats. A further twelve years elapsed before Lieutenant-General Sir Henry George Wakelyn Smith, Bart., Governor and High Commissioner of the Cape of Good Hope, in a Proclamation dated 14th January, 1848, proclaimed the mouth of the Buffalo River a British Port, under the name of the Port of East London.

For the next few years, the settlement was little more than a military station, but gradually, traders and artisans were attracted, and a small civilian population began to settle at the port which was then, and for many years afterwards, confined to the west bank of the river.

By 1870, the number of ships calling at East London had increased to such an extent that it became imperative that safer and more adequate facilities should be provided, and from that time onward, general improvements to the harbour and port have continued, so that to-day, Buffalo Harbour is one of the finest and safest harbours on the South African coast, and the port is well equipped with up-to-date loading and landing facilities. The town of East London now covers an area of nearly 22 square miles, with a population of 72,266 made up of 38,121 Europeans and 37,145 non-Europeans. The value of rateable property is over eleven million pounds.

A description of the port forms the leading article for this issue, and we are indebted to the South African Railways and Harbours Administration for the plan and photographs which have been courteously supplied for illustrative purposes.

The centenary celebrations of the city and port of East London were officially opened by Field Marshal Smuts on the 14th January last, and congratulatory messages were broadcast between South Africa and England, a feature of these being a two-way telephone conversation between the East London Mayor and the Lord Mayor of London and the Chairman of the London County Council. We join in congratulating the management and port officials on their past achievements, and wish them continued success and prosperity in the future.

Turn-Round of Shipping in United Kingdom Ports.

The Report of the Working Party appointed by the Minister of Transport to enquire into the problems concerning the Turn-round of Shipping in United Kingdom Ports—a subject which has been constantly referred to in these columns—has now been issued, and copies have been sent for information and distribution to the British Transport Commission, the Dock and Harbour Authorities' Association, the Council of British Shipping, the Liverpool Steamship Owners' Association, the National Dock Labour Board, the National Joint Council for the Port Transport Industry, and the Port Authorities.

The recommendations of the Working Party are comprehensive, and merit the most careful study by all concerned. As the Minister says in his covering letter, swifter despatch will (1) increase the efficiency of our available tonnage, (2) improve the whole national economy and, (3) save dollars or increase our power to earn foreign exchange. These are major objectives at the present time. The Report urges that high priority should be given to the work of port maintenance and the development of port installations, and suggests there are strong arguments in favour of a more even spread of traffic over the ports of the United Kingdom. The undue congestion of transit sheds is deprecated and the position in regard to railway wagon supply is carefully assessed. Further mechanisation of handling processes is recommended and the suggestion is made that, where practicable, a group of ports might pool certain types of equipment, as was done during the war years.

In a review of labour conditions as they affect turn-round, the Working Party have particularly examined and discussed the subjects of welfare, labour supply, time-keeping piece-work, night-shifts and checking. On this important subject, we think the report is too cautious, and sufficient attention has not been directed to the problem of overcoming the dockers' habits of late starting and early finishing and taking unauthorised morning and afternoon breaks. This should be vigorously dealt with, and other ports would do well to follow the example of the Port of Manchester where an energetic campaign has rid the port of bad time-keeping. This aspect of port working could have been handled with greater firmness in the Report.

At a press conference held early last month the Minister when introducing the Report, pointed out that this country entered the war in 1939 with 16,900,000 gross tons of shipping. We suffered enormous losses, but thanks to the enterprise of British shipowners in ordering new tonnage, we had now reached a figure of 15,700,000 tons. The trading requirements of this country at the present moment were compelling his Department to charter about 2,000,000 tons deadweight of foreign tonnage. He

Editorial Comments—continued

estimated that a saving of but one day in the turn-round of the ships comprising this tonnage would mean 30,000 tons more shipping, and a day saved on the turn-round of all sea-going ships arriving at our ports, would be equivalent to a saving of approximately 100,000 tons. Such a result would be a valuable contribution towards the solution of our present difficulties.

In this connection, the unofficial strike at the Port of London is most regrettable, as it is seriously hampering the country's efforts to increase exports. As was stated by a Minister when questioned in the House of Commons on the matter, the benefits of the dock labour scheme carry with them obligations on the part of all concerned in the industry and these obligations should be strictly honoured.

A Summary of the Working Party's Report will be found elsewhere in this issue, and we hope it will receive widespread attention and that it may go far towards achieving its eminently desirable object.

Port Operation.

Readers of this Journal will be interested to notice that the Working Party's Report touches on many matters which have been discussed in the series of articles on "Port Operation," by Mr. A. H. J. Bown, M.Inst.T., A.C.I.S., General Manager and Clerk to the River Wear Commissioners, and Lieut.-Col. C. A. Dove, M.B.E., M.Inst.T., late Embarkation Commandant, Calcutta, which we have been publishing during the past year-and-a-half. As one example, we observe that the Report lays stress on the value to port authorities of a practical statistical system by means of which continuous watch may be kept upon the efficiency of different berths and varying types of operation. This subject was dealt with as recently as last month.

In this issue, there appears the last of the series, which as we stated at the outset, were intended primarily for students of the Institute of Transport. The articles, which have been appearing every month since January, 1947, have evoked widespread interest and commendation both at home and overseas, and a number of enquiries have reached us asking if they are to be reissued in book form. It is therefore with pleasure that we now announce that, subject to the prevailing paper restrictions, we hope this will be done at an early date. The joint authors are now revising the articles for publication as a book and they are taking the opportunity to incorporate some useful additional material. Further announcements will be made in these pages and elsewhere in due course, and meanwhile, it is strongly recommended that readers should place their orders immediately, as the number of copies printed is likely to be limited.

Port Congestion and Transport Difficulties in East Africa.

For some months past, the serious congestion of shipping at East African Ports has been causing considerable trouble to the port authorities and shipping lines concerned. The problem has been the subject of much comment, in both the technical and popular press, and views and suggestions have been freely ventilated on all sides. Although it has to be admitted that much of the criticism has been of a biassed or political nature, and many of the suggestions have been quite impracticable, nevertheless, in spite of the inadequacy of the present facilities and the abnormal volume of traffic that is being handled, there is unquestionably room for improvement.

It must be remembered, however, that the present speed of development in East Africa is abnormal. The existing dock and railway facilities would have been sufficient for a more gradual expansion but the sudden strain which has been imposed at such short notice, has been too much for the various authorities to overcome. Much of the prevailing congestion at the ports, is due to the inability of the railways to cope with the heavy increase in the volume of traffic, so that the goods at the docks cannot be cleared at sufficient speed. This aspect of the matter has been causing concern to the Ministry of Transport, and a number of conferences have been held between Ministry officials, traders and representatives of the shipping lines concerned in an endeavour to work out a comprehensive plan to solve the many problems involved. Also, during the past few months, Ministry officials from Great Britain have again visited East Africa to study conditions on the spot, and upon their return, they made a number of recommendations which are now receiving consideration.

We are indebted to Mr. P. E. Millbourn, Adviser to the Minister of Transport on Shipping in Port, for the short article which appears elsewhere in this issue. This gives an authoritative over-all picture of the position at a number of East African ports and shows how the railways and transport systems generally are handicapped by the shortage of equipment and rolling stock. The vast distances over which goods have to be hauled also constitute a formidable problem.

It is encouraging to learn that some of the remedial measures which have been put in hand are having a beneficial effect, so that a slightly better state of affairs has been recorded during the past few weeks, and it is to be hoped the improvement will continue.

International Conference on Soil Mechanics.

The Second International Conference on Soil Mechanics has now ended and it is hoped that some of the papers will soon be available. The first conference in Cambridge (Mass.) in 1936 was a great success and there is every reason to believe that this last was also, in spite of the difficulties due to post-war conditions. This subject is of great interest to harbour authorities, since the techniques developed have proved of great help in the design of wharves, warehouse foundations, crane supports, dry docks, etc., and even enter into the questions of river control, water supply, seepage, subsidence, etc. Owing to the fact that waterside structures have often to be based on very poor foundations, the economics and stability of foundations is a fundamental question. It is understood also that the delegates and members attending the Conference had excellent opportunities for studying the reconstruction of the Port of Rotterdam, which has always been a port of pivotal importance in the seaborne trade of Western Europe. The Dutch are particularly well qualified to speak of soil mechanics since their country very largely consists of the Rhine Delta. The alluvium of that Delta together with the coastal dunes of the North Sea offer a field for soil studies which is almost unrivalled. The British National Committee sponsored more than 70 papers and it is probable that the total contributions will have been in the neighbourhood of 200.

The Administration of the Port of Haifa.

Now that the British mandate has ended in Palestine, the future of the Port of Haifa, the principal port of the country, will be watched with interest. From announcements in the press it appears that plans have been made for the port to be administered by a mixed Board, comprising one Briton, one Arab and three Jews. In addition, at least three British officials occupying the key positions of port manager, chief pilot and berthing master respectively, are also remaining, and it is expected that these arrangements will enable all port operations to be fully maintained.

The evacuation of British military forces was completed at the end of last month without incident, and the port was handed over to the new administration in good working order. We wish the new regime every success and hope the port will have a peaceful and prosperous future.

Mechanical Handling Exhibition and Convention.

In view of the need for providing the ports of this country with the latest lifting devices and equipment, all those concerned with the handling of cargo will be interested in the first National Mechanical Handling Exhibition and Convention, which is to be held at the Olympia, London, from July 12th to 21st next.

At the opening luncheon on July 12th, Sir Stafford Cripps, Chancellor of the Exchequer, will be the principal speaker, and during the course of the Convention, papers will be read and discussed at both the morning and afternoon sessions. In all, 17 papers will be presented by leading authorities on mechanical handling methods, and the exhibits of more than 130 firms will be on view. Many of the papers and exhibits will be of undoubted interest to the dock industry, and we extend our good wishes to the organisers and hope the sessions will be well attended.

The Port of East London

An Account of the Development of South Africa's only River Port*

Early History.

EAST LONDON came into being as a result of the establishment of Buffalo Harbour, and the harbour was created out of the supply needs of the Imperial forces then holding the far eastern frontier of the Cape Colony. The use of the word harbour in relation to the year 1836 is, of course, something of an exaggeration, for in those days no ship of any size could have entered the river and even small vessels would have been taking a grave risk of meeting disaster by attempting an entrance. Nevertheless, Buffalo Harbour came into existence on November 19th, 1836—more than 36 years before East London attained the status of a Municipality—when the brig, *Knysna*, of 142 tons, anchored off the river and landed a cargo of grain and food supplies for the British troops at King William's Town.

The *Knysna* was built by Mr. George Rex, the owner, and sailed under the command of Captain John Findlay. On the voyage to the Buffalo, the owner's son, Mr. John Rex, was a passenger and he traded merchandise for wool, skins and hides. The ship remained at anchor in the roadstead until January 31, 1837, the cargo being discharged into the *Knysna's* small surf boats and thus on to the river bank. The voyage to the Buffalo and back to Cape Town was completely successful and Captain Andries Stockenstroom, the Lieutenant-Governor, was so pleased with the experiment—it was he who had authorised the charter of the *Knysna* by the Commissariat Department—that he named the mouth of the Buffalo, Port Rex, as a tribute to the owner.

With the departure of the *Knysna*, ten years were to pass before further recorded mention was made of the Buffalo River. The Governor of that time, Sir Henry Pottinger, decided that it was necessary to have another port on the coast where cargo could be discharged for the Imperial and Colonial troops. In consequence, Lieutenant Charles Forsyth, of the Royal Navy, was sent to survey the Buffalo River and surrounding coast and to report upon its possibilities for use as a port. Fortunately, that report was favourable and on January 14th, 1847, the name of East London was given officially to the new port. Shortly after Lieutenant Forsyth's report was received by Sir Henry Pottinger, the barque, *Frederick Huth* arrived off the river and discharged stores for the newly formed settlement and thereafter a fairly regular service was maintained, but the sandbars effectively prevented ships from entering the river.

Construction of Breakwater and Training Walls

It was not until diamonds were discovered, shortly before the outbreak of the Franco-Prussian war, that real progress was made with the development of Buffalo Harbour. The opening up of the Kimberley fields forced the Colonial Government to take a greater interest in the port and the services of Sir John Coode were obtained. In 1871 work had started on the construction of a breakwater and training walls on the Eastern side of the entrance to the river, as a result of which a channel through the sandbank was made that enabled the German coaster Bismarck to be the first ship to enter and berth in the river, in June, 1872. Sir John Coode, designed the Western breakwater and on August 19th, 1873, the Prime Minister of the Cape Colony, Mr. J. C. Molteno, tipped the first load of stones for its construction. Incidentally, on the same day he turned the first sod of the railway line from East London to Queenstown.

During a visit to Holland about this time, Sir John Coode saw suction dredgers at work for the first time and realising how useful one would be in clearing the mouth of the Buffalo, he persuaded Colonel Schermbrucker, then Commissioner of Public Works in the Cape, to order one. The result was that early in 1886 the suction dredger *Lucy* arrived off the entrance to the Buffalo and proceeded to dredge her own way into the river. So great were the possibilities opened up by this experiment that Colonel Schermbrucker purchased another and larger suction dredger which was named *Sir Gordon* after Sir Gordon Sprigg, East London's Member of Parliament and Prime Minister of the Cape Colony.

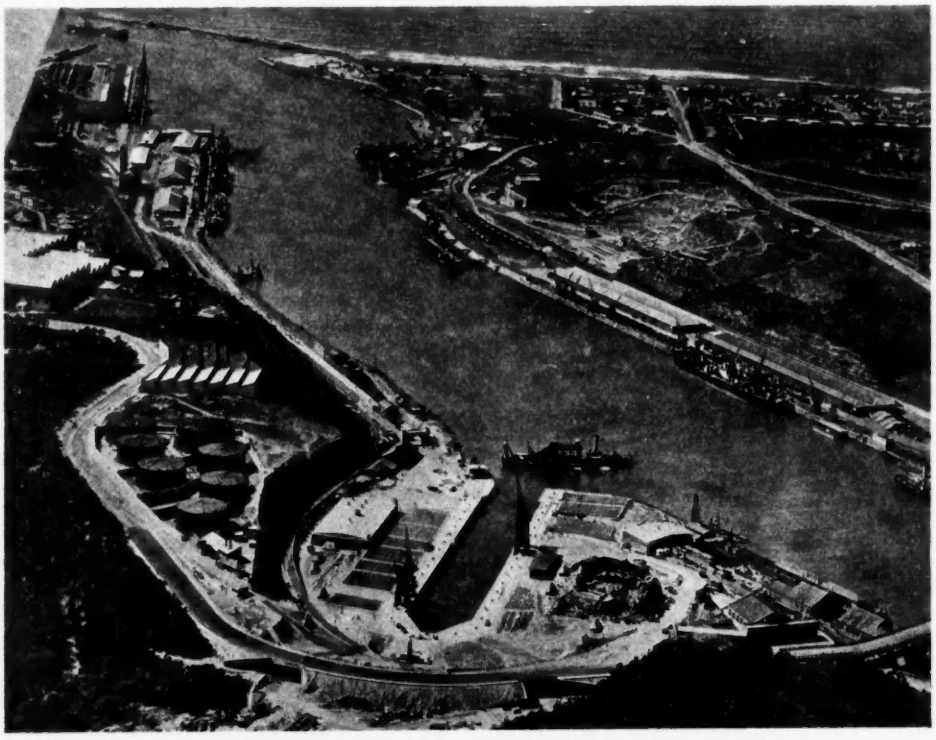
General view of Buffalo Harbour and River, with part of Breakwater and Entrance Channel in foreground and the Two-deck Bridge in background.

Some idea of the usefulness of these dredgers, and of the protection afforded by the breakwaters can be gained from the fact that in 1877, the year after the arrival of the *Lucy*, the river was open to shipping on 245 days and by 1890 this had been increased to 305 days. When it is remembered that the river had not been entered by more than a dozen ships before the year 1876, it is possible to gain a better idea of the vast improvements effected in a few years and possible to obtain a better appreciation of what East London owes to Colonel Schermbrucker and his suction dredgers.

The completion and subsequent extension of the western breakwater, in 1894, together with the widening of the entrance and constant dredging, brought the port of East London more and more sea-borne traffic and by the time that the Boer War broke out, South Africa's only river harbour had been improved to such an extent that the ss. *Montcalm*, drawing 18-ft. 6in. of water was able to enter and be berthed in the river. In the two or three year's following, ever greater use was made of Buffalo Harbour, and in those days it was no uncommon sight to see as many as 30 ships in the river at one time.

*Acknowledgment is made to the "East London Daily Despatch" and "The South African Shipping News" for some of the information contained in this article.

Port of East London—continued



Aerial view of Buffalo Harbour, East London, showing Turning Basin in background, and the Princess Elizabeth Graving Dock in centre foreground.

Further Development

An important milestone in the growth of the harbour was the construction of a bridge across the river. Before 1908 the only means of crossing from West Bank to East London had been by pontoon. So far as shipping was concerned, this lack of a road across the river seriously hampered the handling of cargo and added many days on to the time ships spent in port. The decision to erect a combined road and rail bridge gave the harbour engineers the opportunity they had long awaited and immediately work was started on the construction of a concrete quay on the West Bank 1,600 feet long and equipped with what in those days were considered to be the most modern cranes available. A depth of water of 27 feet at the quayside enabled fairly large vessels to lie there comfortably and the river opposite the quay was widened and deepened to allow ships to be turned. The bridge was opened to traffic on January 4th, 1908, and the first vessel to use the new quay was berthed there four days later. This simultaneous construction of bridge and modern quay brought greater popularity to the port of East London and speeded up considerably the handling and delivery of cargo.

Incidentally, the bridge opened in 1908 was built by the Government of the Cape Colony as a temporary bridge, but despite the tremendous flood of 1922, it stood until the present bridge was built in 1935. The new bridge has two decks, the roadway being carried above the railway track. It is 980 feet in length and is supported on piers some of which are 133 feet high.

Once work on the West Quay was finished in 1908, a start was made on improving the berthage and shipping facilities on the east bank of the river. Concrete quays were put down, electric cranes installed, and new storage sheds built.

Construction of Turning Basin

Despite these improvements, however, it was still impossible to to bring the Union-Castle mailships into the river. The obstacle was not so much depth of water at the entrance or at the quays as lack of space to turn ships over 600 feet in length. In those days, passengers arriving at East London by sea were loaded into a circular basket on the deck of the mailship and swung overboard on to the deck of a launch. The use of a companionway from the deck of the ship to the side of the launch was never attempted because of the heavy swell and sudden winds that swept the roadstead. Cargo was loaded into lighters alongside the ship and these then had to be towed into the river and unloaded.

After a great deal of pressure, the Union Government finally agreed to put the port of East London on the same footing as the other ports of the Union and plans were prepared by East London's Harbour Engineer, Mr. Jack Craig, for the construction of a turning basin near the mouth of the river. The proposal was for a basin 1,000 feet square. This project called for an excavation of the west bank of the river to a depth of about 40 feet and of the east bank of the river to a depth of about 150 feet. Work began on December 3rd, 1928, on the west bank and progressed favourably. In 1930 a start on the much more difficult east bank was made.

Because the country was then in the throes of an economic depression, the Government refused to provide modern mechanical excavators and other aids, and all the work, onerous and difficult as it proved to be, was done by manual labour. Naturally, this slowed up progress enormously and it was not until January 13th, 1935, that the coffer dam which had protected the new turning basin wall was flooded. Five months later the first ship (the *Grantully Castle*) was turned in the new basin and taken to her berth higher up the river. Another five months passed before a ship tied up alongside the eastern wall of the basin—H.M.S. *Milford*, on November 9th, 1935, had that distinction—and it was not until January 25th, 1936, that the first merchant ship—the motor vessel *Stanford*—berthed alongside the quay with 30,000 casks of cement for harbour use.

It took some time to put the finishing touches to the new wall and to complete all the buildings and install all the equipment needed on the quay. Although many ships were berthed there in the following twelve months, it was not until February 13th, 1937, more than eight years after a start had been made on the construction of the basin, that the first mailship entered the river, was turned and berthed successfully, in the C. W. Malan Basin, as it was called. This was the *Edinburgh Castle*, one of the smaller vessels of the Union-Castle fleet of mailships. Approximately six months later, on August 9th, 1937, the Italian liner *Duilio*, of 23,600 tons and nearly 700 feet in length, was brought into the river and berthed, after which the Union-Castle Company's Commodore ship, *Athlone Castle*, and all the other vessels of the mail fleet, began using the river. The *Athlone*, commanded by Captain A. Barron, entered for the first time on November 5th, 1937, the day on which the C. W. Malan Basin was officially opened by Mr. Havenga, Minister of Finance, deputising for the Prime Minister, General J. B. M. Hertzog.

Present Port Facilities

The harbour itself, extending from the river mouth to the modern railway and road bridge which provides the only crossing of the river, is built between steep, high banks. Two breakwaters of 3,200 feet and 1,265 feet in length, protect the harbour entrance where the average depth of water is 35 feet. The width of the entrance is 400 feet. It opens directly into the C.W. Malan turning basin, on the Eastern side of which is the 1,500 foot Charl Malan quay, providing berthing for three large ships. It is alongside this

Port of East London—continued

quay that the Union Castle Mailships berth on their coastal runs. The whole of the East bank of the river affords a total of 3,908 feet of wharfage while that on the West bank has a length of 2,789 feet, so that the port can now accommodate nine merchant ships at a time. In addition there is an oil berth, 455 feet in length which can accommodate large tankers for discharging, and is the only one in South Africa where merchant ships bunkering need use no pumps, as the oil flows in by gravitation from the tanks high up on the bank.

Shed accommodation is good. Recently, with congestion at all other ports, East London was the only port that could find room for a cargo of 7,000 bales of cotton in transit to Australia. The 2,500 tons of cotton had been loaded at South America by the Dutch liner *Straat Soenda* and was kept in the cooling store until it could be picked up for transhipment.

The cargo sheds along the East bank wharves offer 145,512 square feet of storage space. On the West bank there is a further 105,426 square feet while provision is made for the open stacking of 46,200 tons of cargo.

Should East London ever be faced with a berthing shortage, there is room in the anchorage for seven large vessels in 42 feet of water.

Apportioned between the nine berths of the harbour are 39 cranes. These vary greatly in age, some of those on the West bank, for instance, having been erected in 1913, while others are of the most modern. electric types. There are one each of 20-ton, 15-ton, and 10-ton lifting capacity; four of five-tons, 22 of four-tons and nine of three-tons. Completing the number is a five-ton mobile crane. At K shed on the new Charl Malan quay are five Cowans and Sheldon's cranes, and also a further eight cranes built in 1927, which now need replacing.

Princess Elizabeth Dock

The most recent addition to the facilities offered by the port is a dry dock, which was named after and opened by Her Royal Highness the Princess Elizabeth on March 3rd, 1947, during the visit to East London of the Royal Family.

The need for a dry dock at East London was discussed as far back as 1924, and in 1926 a site was actually selected. It was not until 1942, however, that as a result of negotiations between the Hon. the Minister of Transport and the British Admiralty, it was decided to put the work in hand. In terms of an agreement with the Admiralty, the Union Government undertook to provide labour and all material and plant available in the Union. The British Government provided the electrical apparatus, all equipment to operate the dock, and the major portion of the construction plant.

The site selected for the construction of the dock is in the Gabbanga River (more commonly known as First Creek), a tributary of the Buffalo River. Before the site could be made available for construction of the dock, the major task of diverting the course of the river had to be undertaken. The diversion was commenced in May 1943, and the flow of the river turned through it in August, 1944. Another major work was the deviation of Pontoon Road. Although the deviation was only 860-ft in length, it involved the construction of two large reinforced concrete bridges, a new harbour road—also with an overhead bridge—and two deep cuttings through solid rock.

The excavation of the dock site was made possible by the provision of a cofferdam to secure against inflow of water from Buffalo Harbour. This involved the driving of some 36,000 lineal feet of inter-locking steel-sheet piling, which work was commenced early in 1944. With the completion of the cofferdam, pumping was commenced in October, 1944. By February, 1945, excavations had progressed sufficiently to enable a start to be made with the concrete work, and by March of that year a portion of the dock floor, approximately 120-ft. by 42-ft. and 120-ft. of side wall, had been completed. This enabled a start to be made on the erection of the caisson. From this stage onwards many difficulties were encountered and overcome, and in December, 1946, the flooding of the dock was commenced. Thereafter the demolition of the cofferdam at the entrance was carried out.

The Princess Elizabeth Graving Dock can accommodate ships up to 17,000 tons. Its dimensions are: Length on keel blocks, 633½-ft.; width at coping, 102-ft.; width at entrance top, 89-ft.; maximum width at bottom, 69-ft.; depth on sill, L.W.O.S.T., 28-ft.; H.W.O.S.T., 33½-ft.. Two 15-ton and one 5-ton electric cranes are available. The dock can be emptied in four hours.

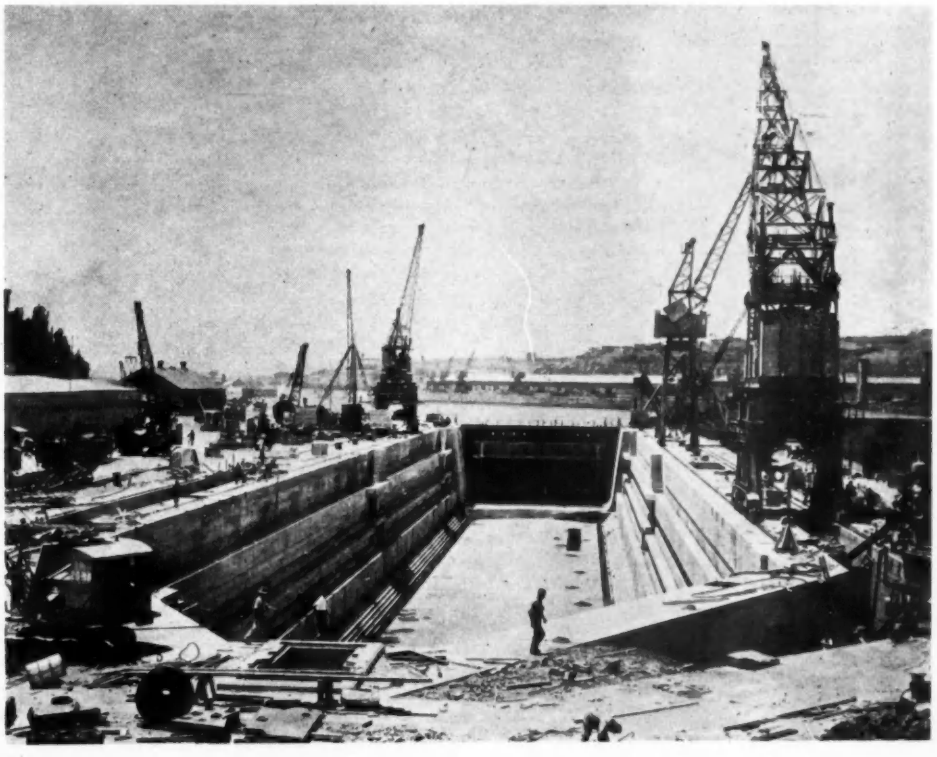
For smaller ships, there is a patent slipway on the West bank, and the dimensions of the largest vessel that can be slipped are: Capacity, 1,206 tons deadweight; length over keel blocks, 208-ft.; maximum beam, 40-ft.

New Landing and Repair Quays

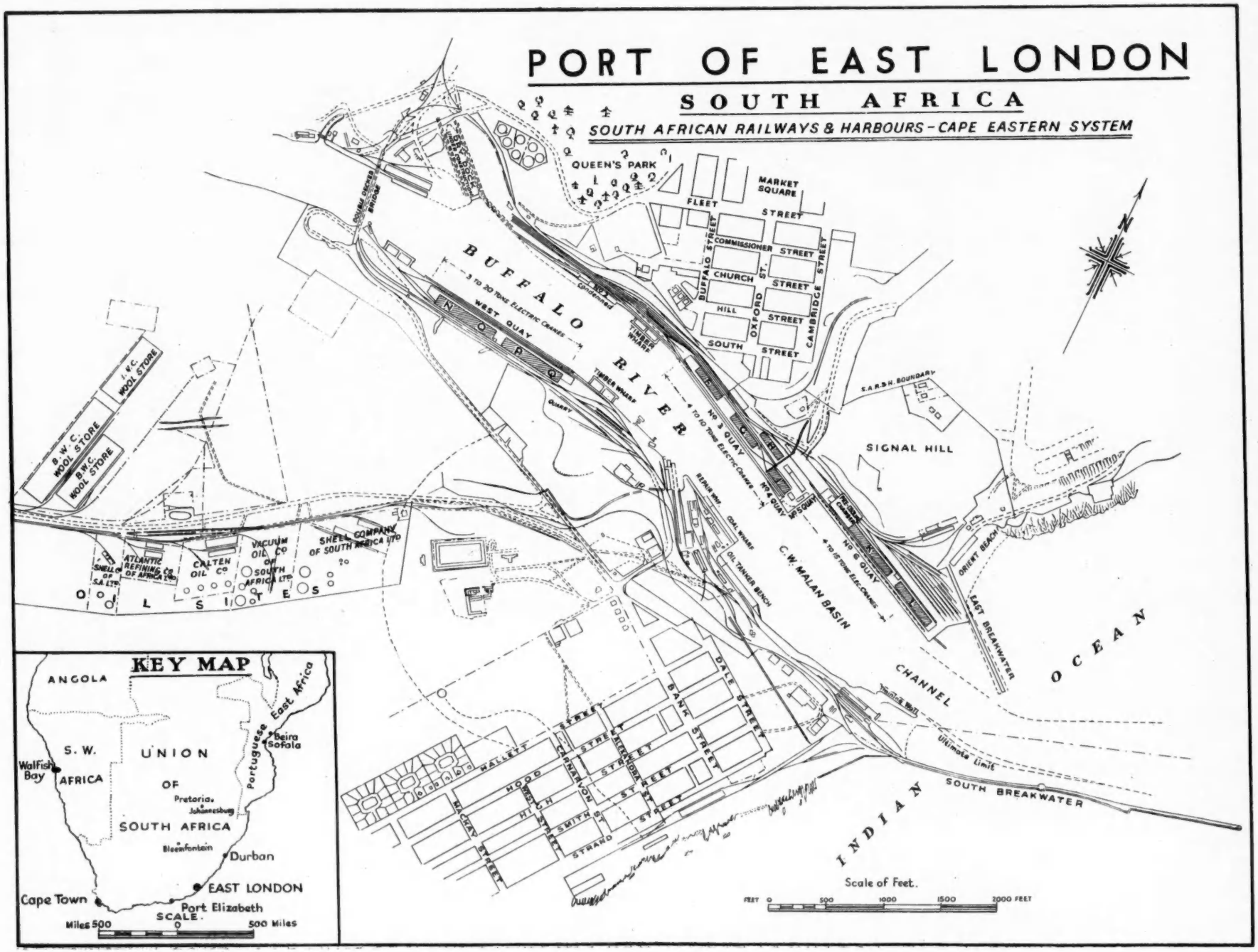
Provision has had to be made for new landing and repair quays, in order to complete the ship repair facilities provided by the Princess Elizabeth Graving Dock. The additions include a quay for vessels awaiting entry to the dock, and a repair quay at which vessels will receive above-water repairs after being discharged from the graving dock.

These landing and repair quays, which abut on to the entrance to the dock, are now in course of construction, and one of the reinforced concrete caissons used in the building of the quay wall is shown shortly after having been sunk to its correct position.

The quay wall consists of 900 ton reinforced concrete caissons built "in the dry" in the Princess Elizabeth Dock, floated to the



View of the Princess Elizabeth Graving Dock nearing completion, showing the three cranes installed.


PORT OF EAST LONDON
SOUTH AFRICA
SOUTH AFRICAN RAILWAYS & HARBOURS - CAPE EASTERN SYSTEM
QUEEN'S PARK
MARKET SQUARE
FLEET STREET
COMMISSIONER STREET
CHURCH STREET
HILL STREET
SOUTH STREET
BUFFALO STREET
ST. OXFORD STREET
CAMBRIDGE STREET
BUFFALO RIVER
3 TO 20 TONE ELECTRIC CRANES
WEST QUAY
No. 1 QUAY
No. 2 QUAY
No. 3 QUAY
No. 4 QUAY
No. 5 QUAY
No. 6 QUAY
4 TO 15 TONE ELEC. CRANES
TIMBER WHARF
SIGNAL HILL
S.A.R.&H. BOUNDARY
B.W.C. WOOL STORE
I.W.C. WOOL STORE
B.W.C. WOOL STORE
SHELL COMPANY OF SOUTH AFRICA LTD
VACUUM OIL CO OF SOUTH AFRICA LTD
CALTEX OIL CO
ATLANTIC REFINING CO OF AFRICA (PTY)
SHELL OF S.A. LTD
OIL JETTIES
REPAIR WHF.
COAL WHARF
OIL TANKER BENCH
C. W. MALAN BASIN
ORIENT BEACH
EAST BREAKWATER
CHANNEL
OCEAN
INDIAN
SOUTH BREAKWATER
Ultimate Limit
DALE STREET
BANK STREET
ALEXANDRA STREET
CARNARVON STREET
HOOD STREET
HALLETT STREET
MACKAY STREET
SMITH STREET
STRAND STREET
Scale of Feet.
FEET 0 500 1000 1500 2000 FEET
KEY MAP
ANGOLA
S.W. AFRICA
Walfish Bay
UNION OF SOUTH AFRICA
Portuguese East Africa
Beira
Sofala
Pretoria
Johannesburg
Bloemfontein
Durban
EAST LONDON
Cape Town
Port Elizabeth
SCALE.
Miles 500 0 500 Miles

Port of East London—continued

site, flooded and sunk on to a prepared bed in the line of the quay wall. The caissons are finally filled with concrete to give them weight, after which they are backed with filling to form the quay and the surface behind it. The method of constructing the quays is the same as that employed in the "Mulberry Harbour" in Normandy, on the occasion of the Allied landing on "D" Day and, incidentally, in the construction of the deep-water berth at Durban in 1936.

If the proposals of the harbour authorities are accepted by the Government, another concrete quay wall will be built from the dry dock to connect with the existing quay at F Shed. When this becomes an accomplished fact, the port of East London will have wharfage accommodation for at least 22 ships and will then be in a position to handle easily and expeditiously all the traffic that is expected to flow through Buffalo Harbour when the regrading of the railway line is completed and development work starts on the new Free State goldfields.

Trade Statistics

East London has, from time to time, set several records for fast cargo handling. One of these was the offloading, in 1935, of 10,000 casks of cement from the *Stensby* in seven hours.

Another feat, which was claimed as a South African stevedoring record at the time, was the discharge, in two and a half days, of 5,000 tons of box boards, flooring boards and general cargo in the *Thermopylae*.

This speed is still a feature of the port, although traffic has not yet reached its pre-war level. The biggest single commodity handled is wool and in the export of this East London is only slightly behind Port Elizabeth. In the 1932-33 season, 326,038 bales of wool were shipped through Buffalo harbour. By 1940, because of the war, this had decreased to 153,282 bales. The quantity became less and less while the war went on until, in 1946, it increased again to 145,435 bales. Last year, it reached a peak of 448,404 bales.

Yet traffic in general is still far below the harbour's potential. Quantities passing through the port are still less than in 1939, as the following table shows:—

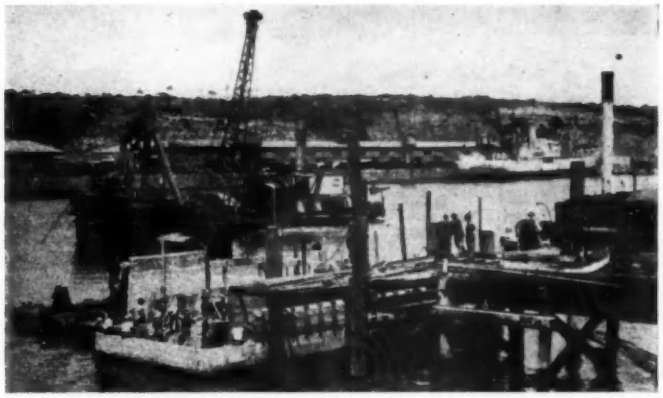
Cargoes Landed			**(Tons)**	
	1939	1946	1947
General Cargo	261,000	112,399	241,646
Timber	38,400	17,400	49,000
Grain	8,000	28,000	64,000
Bulk petrol	206,700	93,600	128,200
Railway materials ...	135,000	97,000	56,200
Cargoes Shipped		**(Tons)**	
	1939	1946	1947
General	8,000	2,000	4,000
Timber	310	370	604
Chilled beef	700		
Wool	90,200	54,600	175,600
Fruit (citrus)	14,900	9,900	11,600
Skins and hides	7,900	2,100	4,120
Bunker Coal	875	1,500	771
Other produce	2,400	1,200	1,300

Since the end of the war, too, the number of ships using the Buffalo harbour has almost doubled. From March 1945 to March 1946, it was entered by 327 vessels. For the same period during 1946-47, however, this had increased to 657. Shipping increased in this one year from 1,163,015 to 3,524,577 gross tons—more than trebling itself. While this increase was, in part, due to the increase in shipping, it was also largely because of the number of bigger ships which have started to use the harbour.

Nearly half of all the citrus produced in the immediate hinterland passes through East London and this forms the port's second biggest export.

In the four chambers of the pre-cooling shed, completed in 1936, 1,500 tons can be cooled at one time. In its cargo shed, 57,685 square feet in area, there is a storage capacity of 776,558 cubic feet. There are two shipping galleries for loading.

Citrus has, however, only recently become an important cargo. Shipments have increased enormously since the first cargo left East London in 1922. It consisted of 2,554 cases—hardly to be compared with the record-breaking citrus shipment of 146,412 cases twelve years later, in 1935.



Placing the caissons in position for the new quay wall.

By 1939, citrus shipments through the port totalled 14,900 tons. During the war, with activity in the port reduced virtually to nothing, only 9,000 tons was handled. Last year, however, the quantity once more rose, almost to its pre-war level when 11,600 tons was exported.

Shore-Based Radar for Harbours and Ferries

Functions and Technical Requirements

I.—Historical Background

The use of airborne and shipborne radar to detect and determine the position of aircraft, ships and obstructions is well known; as also is the use of " ground radar " to detect aircraft, and to guide them in bombing and interception. The possibility was therefore foreseen of using shore-based radar in peace-time in connection with ships near the coasts and in harbours.

In the summer of 1946, the Admiralty, in conjunction with the Mersey Docks and Harbour Board, carried out experiments with naval radar equipment set up ashore at Liverpool, which demonstrated the potential usefulness of shore-based radar. These experiments also showed that at Liverpool the full operational requirements could be met only by a fairly large specially designed installation. Such an installation is being constructed and will be in operation in August, 1948. Experiments have also been carried out at Southampton, Halifax (Nova Scotia), and in France and America and have confirmed the belief in the value of shore-based radar.

At the first International Meeting on Radio Aids to Marine Navigation (I.M.R.A.M.N.), in May, 1946, the purposes and requirements of shore-based radar were discussed, and it was agreed that there were many possible applications (see Section II). This conclusion was reinforced at the second I.M.R.A.M.N. in May, 1947, and it was decided to encourage further operational trials.

Shore-based radar installations are now in use at Wallasey* (in operation since September, 1947) and at Douglas,† Isle of Man (February, 1948). The former was set up to supervise the operation of the Wallasey-Liverpool ferries crossing the River Mersey; its use has since been extended to the neighbouring Birkenhead-Liverpool ferries. The installation at Douglas is used to supervise shipping entering and leaving harbour; the traffic consists almost entirely of ships on the regular run between Liver-

* Described in The Dock & Harbour Authority, October, 1947; and † April, 1948.

Shore-Based Radar for Harbours and Ferries—continued

pool and Douglas. Both installations consist substantially of a " standard " general purpose marine radar set designed for use on board ships, with the addition of a radio-telephone system.

Shore-based radar installations are under consideration at a number of other ports in the United Kingdom and elsewhere, and it is believed that some are under construction.

II.—The Functions of Shore-Based Radar

The first function of shore-based radar is to make known to the shore authorities, readily and accurately, the position and movement of all ships and other craft in the area concerned, and thereby, in conjunction with radio and other means of communication, to help them to plan berthing, docking, departures, and other harbour operations, more quickly and more efficiently. The radar will give immediate detailed information on the state of the channels, in particular the position of anchored ships.

The second function is to show whether buoys, light vessels, and any other navigational marks, are in position; and if they are not, to enable them to be repositioned or replaced quickly and accurately.

A possible third function is to determine immediately the exact position of any casualty, so that the best assistance and the correct salvage operations can be started at once.

The fourth purpose is to inform ships in the area, by radio-telephone, of their exact position and of the position of other ships, and of any irregularity in navigational marks. By this means ships may be able to keep moving (e.g., by " hopping " from buoy to buoy) when movement would otherwise be precluded by absence of knowledge of conditions at more distant points which cannot be seen, or because the movements of other shipping were unknown. A particular case is the use of shore-based radar for ferries which may be able to cross an estuary or channel if the radar shows it to be clear of other shipping.

A subordinate facility is that of " talking home " or guiding a tug or tender to a waiting ship when she cannot be seen from a distance but when conditions are otherwise safe for the two to meet.

It is clear that these functions are most useful, and the radar installation of most value, when visibility is bad and ships are held up. But shore-based radar has many uses which are valuable in all conditions of visibility. For example, it gives information at a central point much more quickly and easily than other means such as reports from signal stations or harbour launches, and it also gives the position of ships and navigational marks with an accuracy not otherwise obtainable except perhaps by such means as optical range finders or cross bearings from a number of points. Moreover an installation so sited that it can " see " all parts of the channels enables information to be given to ships about conditions in parts of a channel which they cannot see because of a spur of land.

III.—Technical Requirements

The technical requirements of a harbour radar installation are determined essentially by the operational requirements. Thus, when the area over which radar supervision is required, and the performance as regards range, range and bearing discrimination, and range and bearing accuracy, have been specified, the principal technical characteristics of the radar installation have been prescribed.

Given the operational requirements the radio engineer can decide such matters as the size and characteristics of the aerial or aerials, the pulse length, and the size and nature of the displays. In arriving at a technical solution the engineer must decide whether he can more economically fulfil the requirements with a single radar installation or with a number of installations placed at several points within the area of the harbour. This decision may be guided by the availability of site or sites, and by the views of the operating authority on the desirability of a single, possibly large, installation as against a number of smaller installations. Problems of staffing, operation and maintenance, as well as initial cost, have to be taken into account. In exceptional cases it may be entirely impossible to comply with all the operational requirements by means of a single installation; for example, the presence of a large island or neck of land may prevent the whole of the required area from being " viewed " by radar from a single point.

Another factor which influences the technical design is the location of the main display. i.e., where information from the radar screen(s) is collected and passed on to the shore authorities and to ships. Often, the best location for the radar installation or installations is not the best position for the main display. The latter may be required to be in a control office in the headquarters of the port authority, several miles distant from the radar set or sets. If this is a requirement which *must* be met, it may well influence the engineer in a decision as between a single or multiple radar installation. Consideration may have to be given to transmitting the display (by land-line or radio) from the site of the main equipment to a central office.

In principle, the drawing-up of the operational requirement specification should be done without reference to what is technically possible. It is for the radio engineer, later, to say whether or not this or that requirement is realisable with known techniques and, if not, to what extent the requirement must be relaxed to make it so. Then the user must decide whether such a relaxation is acceptable.

In practice, however, it will be better for the user and the radio engineer to collaborate in drawing up the requirement specification. By this arrangement the user may be prevented from asking for an unnecessarily difficult requirement while, at the same time, he may be encouraged to insert a requirement which is not at first sight obvious and which can easily be met. The user should not, of course, sacrifice any operational requirement which is essential, because it is difficult technically to achieve. It is of course to be remarked that until radar has been used far more widely it may not be possible to visualise completely the ultimate requirements. Nevertheless, before attempting to draw up a requirement specification, the user authority must decide upon some at least of the more important uses to which the radar set is to be put.

The most important requirements which have to be specified are these:

(a) The area to be covered by the set.
(b) The range performance of the set, i.e., the smallest object which it is necessary should be discernible at various points in the coverage area. This may not be the same in all parts of the area; for example, in outlying parts of the port it may not be necessary to discern the smaller craft such as small wooden boats whereas in certain other areas it may be required to see everything that lies on the water, including rowing boats.
(c) The discrimination required, i.e., ability to see as two separate objects, a pair of objects a given distance apart. Again this may be different in different parts of the area.
(d) The "relative" accuracy of each display. i.e., the accuracy of the relative positions of two objects a given distance apart.
(e) The " absolute " positional accuracy obtainable from the set, i.e., the accuracy with which the position of an object relative to a known fixed point (on shore) can be determined. In other words, the accuracy which can be ascribed to a position obtained from the radar set when transferred to a chart.
(f) Whether it is required to be able to determine the aspect of ships in a particular area, i.e., how they are heading.
(g) The scale of the display or displays. This should not be specified arbitrarily but should be consistent with the earlier requirements. For example, there is no point in requiring a large scale display of an area in which only relatively poor discrimination is required.
(h) The location of the main display.

There will be other requirements which will affect the details of the design. For example facilities for communications (telephone, etc.), for checking performance, for photographing the display for record purposes; and the provision of duplicate displays at other points than the main display. The main engineering features are however determined by the list of requirements (a) to (h) above.

IV.—The Various Applications

The general applications of shore-based radar may be divided into six categories. Whether particular requirements call for a

Shore-Based Radar for Harbours and Ferries—continued

specially designed radar set or may be satisfactorily met by a standard general purpose marine radar set depends principally upon the category in which they fall. A standard marine radar set means a set complying with the specification published by the Ministry of Transport in " Radar for Merchant Ships: Performance Standards " (H.M.S.O. No. 55-247).

(i) **Large centralised port.** A single fairly large specially-designed radar installation is required and the communications problems (see below) are complex. Liverpool and Southampton are typical examples.

(ii) **Large extended port.** No single site commands the whole area and two (or perhaps more) separate equipments are necessary; these may be relatively simple standard marine radar sets; the communications problems are similar to (i) but land-lines and an operational procedure linking the sites are required. The Clyde is in this category.

(iii) **Small general ports.** A standard marine radar set, perhaps with minor modifications, is sufficient and the operational problems are simpler. Probable examples are Newport, (Mon.) and Sunderland.

It should be noted that until the operational requirements are laid down, it may be impossible to place a particular port in one of these categories. For example, London may be in (i) or (ii); and the Humber may be in (i), or (more probably) in (ii), or the ports of Hull, Immingham and Grimsby may be considered independently in (iii).

(iv) **Ferry terminal port.** A standard set (with or without small changes) will do all that is required, and the operational and communications problems are considerably simplified because only a limited number of ships regularly using the port are concerned. Douglas is a good illustration.

(v) **Single ferry service.** This is the easiest application, only a few ships are involved, the area to be covered is very limited, and the required communications system is very simple. Wallasey is an excellent example.

Attention is drawn to the use of ship-borne radar on ferry vessels (e.g., the Tay ferries), which in certain conditions may better meet the needs; the choice between ship-borne and shore-based radar for ferries depends on the length and nature of the run, the number of ships in use, the number of officers carried, and the organisation at the terminal points.

(vi) **Coastal radar station.** The use of radar on the coast (or perhaps on a light-vessel) to watch shipping, especially in dangerous waters such as around the Goodwins, is possible and may later prove valuable, but at present it would be limited by the difficulties of communicating quickly with a ship standing into danger.

Sufficient experience is available to demonstrate that a specially-designed radar set is required in large ports and that a standard marine radar set is adequate in ferry terminal ports and for single ferry services; but the application of standard sets to smaller ports, or as part of a composite installation in large extended ports, seem to be possible on general grounds, remains to be effectively demonstrated. Moreover a standard set may be used as a means of studying the problems of shore-based radar in a large port, even though it is known that it can never fulfil all the operational requirements. For these reasons and because of their availability and relative cheapness it is important to know the technical capabilities of such sets and these are described in Section V. Modifications of a standard set are possible, both to increase the operational convenience of the equipment and to some extent to increase its technical performance, to suit particular conditions.

The requirements and conditions at ports differ so much that it is impossible to estimate accurately the cost of a radar installation. A very rough estimate is in the order of £30,000 for a specially-designed radar in a large centralised port and £3,000 to £6,000 (depending on what modifications are made) for a standard marine set. To this must be added the cost of the radio-telephone equipment required, bearing in mind that this will probably be part of a radio installation, such as may be already in use, serving other purposes than in connection with radar. The problems of communications are discussed in Section VI.

V.—The Capabilities of the Standard Marine Radar Sets

In this section it is assumed that no major modifications to a standard set are made (e.g., no change in aerial dimensions, pulse length, etc.). However, some modifications can be considered relatively minor (e.g., changes in range scales), and to a lesser extent, the substitution of a larger cathode-ray tube for the normal 9-in. diameter tube). With these restrictions the following are the relevant performance figures:—

(a) **Range performance.** The set should detect a second class buoy at 2 miles and a 30-ft. fishing vessel at 3 miles. A tramp of 5,000 G.R.T. should be visible at 7 miles.

(b) **Discrimination.** The set is required to be able to see separately two small objects in line with the radar set when these are 100 yards apart (or more) or two small objects abreast when the angle subtended by them at the radar set is 3° (or more). The *range* discrimination is independent of distance from the radar set. The *bearing* discrimination when expressed in angular measure is also independent of range; when expressed as a length the bearing discrimination is poorer at greater distances. Thus an arc of 3° is approximately 100 yards at 1 mile; 200 yards at 2 miles and 500 yards at 5 miles. In practice, several of the commercial marine sets employ an aerial larger than is absolutely necessary to meet the official specification and some have a bearing discrimination twice as good as the above (i.e., 50 yards at 1 mile, 100 yards at 2 miles, etc.). The range over which a standard marine set will satisfy the requirements of a harbour installation is thus largely determined by the angular discrimination available in relation to the user's requirements. If, as seems reasonable, the user requires a discrimination of better than 100 yards, irrespective of orientation, the set which just satisfies the specification will meet this requirement over a radius of 1 mile while the sets with better angular discrimination will do so over a radius of 2 miles.

(c) **Positional accuracy.** The set is required to be capable of giving the bearing of an object with an accuracy of 1° and must provide means for estimating the range of any object with an error not exceeding ± 5% of the maximum range obtainable on the scale in use. Assuming, for example, a range scale of 2 miles, these requirements are equivalent to a maximum positional inaccuracy of *200-ft.* at right angles to the radius from the radar set, and 100 yds. along a radius. The relative positional inaccuracy of any two points on a display (other than in the case in which one of these two points coincides with the radar set) may be up to twice as great as these values.

(d) **Aspect of Shipping.** The beam width of a standard set is 300-ft. at 1 mile from the set and 600-ft. at 2 miles. As already mentioned in (b) above some sets may have a beam width of about half of these values. In the case of the larger ships it will usually be possible to decide whether they are lined end-on or broadside to the radar set when they are within a mile or so of the set, but broadly speaking, the standard set will not indicate aspect very satisfactorily.

(e) **Scale of display.** Normally a 9-in. cathode-ray-tube giving a 7-in. display is used. Assuming a scale of maximum range of 1 mile (about the largest scale conveniently available), a natural scale of 1/20,000 is the maximum available. This will easily permit the full discrimination of which the set is capable to be obtained. The provision of a display with a larger cathode-ray-tube (say 15-in. tube) would not require radical alteration of the design of the set and would enable a somewhat larger scale to be available if desired or, what is probably more to the point, would provide a moderately large scale picture over a greater range.

With these figures it should be possible to decide to what extent a standard marine set will satisfy all or any of the operational requirements for a harbour (or ferry) radar set in any particular instance.

VI.—Communications

Unless the radar set is to be used by the port authority simply as a source of information for its own purposes, *direct* radio com-

Shore-Based Radar for Harbours and Ferries—continued

munication between the radar operator and mobile craft within the port area is indispensable, since the links provided by the coast radio stations and telephone lines cannot deal with all the situations which might arise. As indicated in Section IV, there are a number of special cases to be considered in which the communications problem may be of various degrees of complexity.

In the simplest case it may be necessary to communicate with a few particular vessels only. This may be so at, say, a ferry terminal in which only a few ferry boats are concerned or in a harbour in which the port authority wishes to communicate only with a few craft under its own direct control (e.g., survey craft). In this case, a very simple radio installation is possible on any convenient available wavelength, and the few craft concerned may be fitted with permanent radio-telephone sets. The larger the harbour the more varied is the shipping concerned, and the more the radar set is used for assisting the movement of all classes of shipping, the more complex does the communication problem become.

In a large port, the ideal of having all craft of any size using the port fitted with a suitable radio-telephone will probably be slow of achievement. In such a case, craft regularly using the area (including ferries or craft belonging to the authority) would possibly be among the first to be permanently fitted. Large vessels entering the port might be provided for by means of portable equipment carried on board by the pilot. Up to this point the matter can still be considered a purely local one and none but local considerations are involved in the technical requirements of the communications equipment.

Ultimately, however, one might hope that all craft using the port, including vessels entering from overseas will carry as part of their normal equipment a suitable radio-telephone set. This of course raises at once the problems of standardisation and of international agreement. There must be standardisation of frequency and of certain other technical features.

Both IMRAMN'S in 1946 and 1947, recognised the essential nature of communications in connection with shore-based radar and the need for international agreement as to frequency, and both meetings recommended the international allocation of a frequency in the very-high-frequency band for this purpose. At the meeting of the International Telecommunications Union in Atlantic City in 1947, the frequency 156.8 Mc/s was designated for international use for harbour communication purposes. This lies within a band (156-174 Mc/s) available for the maritime mobile service and it is evidently desirable that the development of harbour communication systems should proceed within this band. In general the universal frequency 156.8 Mc/s could be used, though in large ports additional adjacent frequencies might also be required, both in connection with radar and for other purposes; this adds to the problem of standardising equipment.

Agreement is also needed as to the type of modulation to be used, viz., amplitude or frequency modulation (A.M. or F.M.). This problem is being studied and it would appear that the relative advantages and disadvantages of the two types are not marked.

Finally, it must be stressed that the larger the port and the more extensive the use of the radar equipment in connection with the movement of shipping the more elaborate and complete must be the whole communications network. Certain outlying fixed points such as signal stations, lighthouses, or the pilot office, may require to be in communication with the radar control. In general such communications with fixed points should be by land-line, thus freeing the radio channels for the maximum use by mobile craft. All communications however both with fixed and mobile stations should pass through a single control centre at which some form of exchange switchboard will be required.

There remains the problem of the very smallest craft such as barges, fishing vessels, or small yachts not in radio communication with the radar control. Presumably, in poor visibility, such craft, if in motion at all, would be moving slowly and within the limits of their visual lookout. The movement of larger vessels with shore-radar assistance would not therefore be greatly hampered by the presence of such craft. The larger vessels would be fully informed from the radar of all craft in the vicinity and would take action in accordance with circumstances.

In particular areas, loud-hailer arrangements at points of key importance could be arranged to provide one-way communication with all craft, including the smallest. Such loud-hailer systems are not however a satisfactory means of handling the communications problem in general.

VII.—Outstanding Problems and Conclusions

The use of shore-based radar for the supervision and possible control of certain craft is only just beginning. It is impossible at this stage to see clearly all the problems which are as yet unsolved. Some however are immediately obvious. For example, there is the problem of the positive identification of ships seen on the radar screen. It may be that, with an adequate communications system and proper operational procedures of reporting and recording the progress of important vessels appearing on the screen, any more positive means of identification will not, in practice, be required. This means that in the larger ports at least, an operational plot, possibly " filtered," will have to be maintained, on which the position of all important ships is shown for the benefit of the " operations officer." (It should be remarked that the situation will never arise in which an unidentified ship enters the immediate approach channels and then comes into communication for the first time and simply asks for her " position "; requests from such ships will be in some form such as " I have just passed " X " buoy—where do I stand in relation to the next buoy " or " I am passing so and so; what is in the channel ahead of me ").

However, it is also possible that such a plotting system by itself will not be completely satisfactory. In this case positive identification of particular ships may be required, for example pilot tenders and harbour launches or large ocean-going vessels. One method might be for the ships in question to carry a small radar beacon which could be switched on at the request of the radar control room and which would indicate the ship in question on the radar display. The beacon might also be of the responder type similar to the " I.F.F." systems used for the identification of friendly aircraft during the war. This type of beacon is triggered by the shore radar and produces a characteristic response which would enable a particular ship to be identified.

Another possibility is to use some form of direction finding, possibly in connection with the V.H.F. communication channel. Existing types of V.H.F. direction finders, particularly of the direct-reading types, are in general less accurate than centimetric radar, and it is not certain that such a system would be sufficiently accurate.

Another problem that has been referred to in the section on communications is that of communicating with the smaller craft in the harbour. Ideally there should be no craft at all afloat in the area under radar supervision with whom the radar operator cannot communicate, but the achievement of this ideal is somewhat remote. Yet another problem is that of detecting the smaller craft at extreme ranges.

Apart from technical problems such as the above, there are also, of course, operational problems which will only be properly recognised and understood as more and more practical experience is gained in the application of shore-based radar.

In particular there is the question of ensuring full confidence between the Masters and pilots of ships and the " operations officer " of the radar station. To this end this officer must have, and must be known to have, the fullest knowledge and experience of the responsibilities of Masters and pilots, of local navigational conditions, and of the capabilities and limitations of his equipment —he must be in fact a senior man and far more than a " radar operator."

Although it is not a serious or difficult problem, consideration must be given to the question of fitting reflectors to buoys to increase the range at which they can be detected by the radar set.

Apprehension of the possible difficulties must not however hold up the application of shore-based radar to shipping. Shore-based radar used in partnership with ship-borne radar can provide the mariner with the most powerful navigational aid in pilotage waters in conditions of low visibility, and even when the visiblity is good, that he has yet had; and it is important that its advantages should be made as widely available as is practicable.

Problems Confronting East African Harbours and Railways

By P. E. MILLBOURN
Adviser to the Minister of Transport on Shipping in Port.

The end of the war brought to many countries the realisation that their national fortunes in the post-war era would no longer be found in a return to pre-war sources of supply for raw materials and foodstuffs or to former markets for their exports. In no country was this more true than in the United Kingdom, where, after six years of war, we were left without the balances of foreign exchange with which to pay for what was essential to our national life.

To develop the natural, and as yet almost untouched, resources within the Dominions and Colonies was one way to recovery in our national fortunes; of all the areas within the British Commonwealth, the Colonies of East Africa and the Rhodesias, together with the mandated territory of Tanganyika, appeared to offer the most promise and the quickest return. And so it has come about that, led by the Ministry of Food's groundnuts scheme in Tanganyika and the steady flow of settlers to East Africa and the Central African Territories, a large number of developments are either under way or planned for early commencement in these areas. This rapid start, together with a large increase in the flow of imports to make up for the shortages created during the war years, has placed a heavy load on the transport facilities which exist in East and Central Africa and has shown very clearly to the planners and those responsible for these many ventures the soundness of early advice given by those who realised not only the vastness of the territories to be opened up, but the inadequacy of ports, railways and roads within them.

The eastern seaboard of Africa, north of the Union, contains few major ports: Lourenço Marques, Beira and Kilindini being the exceptions. It is only within these harbours that ocean-going ships can lie alongside quays for the discharge and loading of their cargoes.

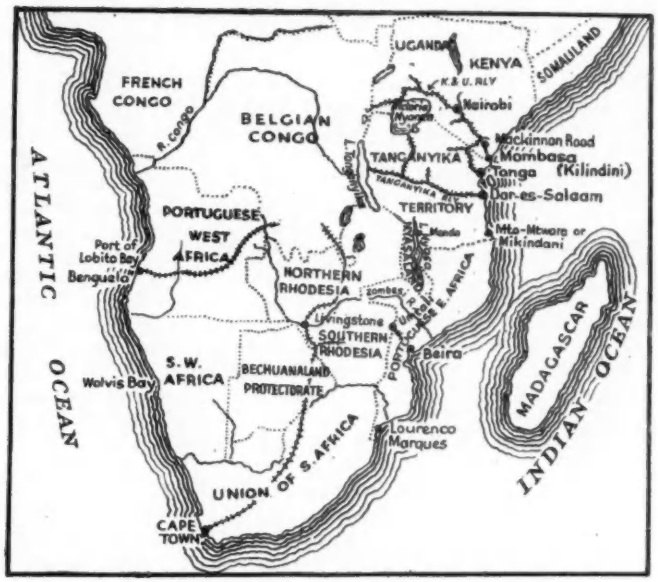
The territories of Kenya and Uganda are almost exclusively served by the Port of Kilindini, on the island of Mombasa, which is connected to the mainland by a short causeway. An alternative route to the hinterland of these territories is to be found at the lighterage port of Tanga in Tanganyika territory, which is connected by a branch line to the main railway from Mombasa to Nairobi and thence onwards into Uganda.

Kilindini is a modern port, fully equipped with facilities for the rapid handling of import and export cargoes, as well as passenger traffic. The large natural harbour, which was extensively used by the Navy during the last war, is capable of further extensions to handle increasing traffic, but at the present time the port capacity is taxed to the utmost by the tonnages of commercial cargo which it has to handle, and the added burden of military stores now being shipped from the Middle East and elsewhere to the new store at Mackinnon Road, a distance of some 67 miles from Mombasa.

The main difficulty at the present time in dealing with the load of traffic flowing through the port in both directions is the inability of the Kenya and Uganda Railway to clear the cargo from the port area. Here the main difficulty lies in the fact that this railway, in common with many other systems, was during the war without its normal flow of replacements in locomotives, rolling stock and other equipment. At the same time, it was called upon to play a vital part in the war effort, which it did with conspicuous success. Nevertheless, it was left at the end of hostilities with grave shortages in its essential requirements and in no way equipped to handle even greater traffic. Under present arrangements, it does not appear that the full benefit of its programme of reconstruction and new equipment can be felt before 1950, but in the meantime it is keeping up a high standard of performance with the tools it has and maintaining a reputation it has justly earned in the past. It has recently been suggested, however, that it may be necessary to introduce some form of control of the import of goods into these two territories if the most efficient use is to be made of all forms of transport serving the area.

It is at Dar-es-Salaam, the main port of Tanganyika, which is situated at the terminus of the railway which runs through the Central Province and forms a link with the Belgian Congo, that the greatest difficulties have so far had to be contended. Unfortunately, the beautiful harbour in which this port is situated is not all that is required by the type of ship which mostly serves East Africa and considerable dredging of the entrance to the harbour, and the harbour itself, will have to be undertaken before modern requirements can be said to have been met in this one respect.

The port itself is to some extent the legacy of the German occupation of the territory in the days prior to the first world war. The only facility which it possesses is a lighterage wharf, to which some extensions were carried out by the Tanganyika Railways and Harbours Services between the wars. Import and export cargoes have all to be dealt with overside into and from lighters. In the past it has shown itself capable of dealing with the import and export traffic of the territory, even if its service to shipping may have left something to be desired. The post-war develop-



ments, however, have shown the facilities to be inadequate to handle an increasing volume of traffic and congestion, both in the port and on the railway, has resulted. These delays, particularly in the discharge of cargoes and their clearance by the railway, have made it necessary to regulate the flow of imports, which has resulted in some delay to the time-table of the groundnuts scheme.

Clearly, if Tanganyika is to go ahead in its economic development at the rate which present events indicate, the main port at the terminus of its central railway should be extended and brought up-to-date with modern facilities. Plans for deep-water berths and an extension of the port area for transit sheds, warehouses and railway sidings, as well as other developments, are at the present time under consideration by the authorities, and it is hoped decisions will soon be taken in this important matter.

The Ministry of Food's groundnuts scheme, which is now under the control of the newly formed Overseas Food Corporation, provides for the development of two areas in Tanganyika, one in the Central Province and the other, and larger area, in the Southern Province. The area in the Central Province is, fortunately, close to the main railway leading to Dar-es-Salaam and will be served by these transport facilities. The area in the Southern Province is, however, much more remote and at the present time there are practically no facilities in the way of port, railways or roads with which to serve its development.

It was for this reason that the construction of a new deep-water port and a railway have been decided on.

The site of this port is on the harbour of Mto Mtwara, some few miles north of the Portuguese East African border, and con-

Problems Confronting East African Harbours and Railways—continued

struction work on the first of its deep-water berths has now been commenced. The new railway, also at present under construction, links the new port with the growing areas which lie at a distance of some 120-130 miles from the seaboard.

The railway is being constructed on a metre gauge to conform with other railways in the East African territories, but in view of its proximity to the next railway system in the south, i.e., Rhodesia Railways, which is operated on a 3-ft. 6-in. gauge, the new railway and its equipment are being designed to suit a rapid conversion to the wider gauge at an appropriate time in the future.

The new port of Mto Mtwara or Mikindani, as it has now been named, may very well become the largest port on the East African seaboard, and the site which has been chosen for the initial construction offers every facility for extensions. Those who believe in the future of the African Continent see vast opportunities in the opening up of the Southern Province of Tanganyika, which will be made possible by the construction of the new port and railway. The area is at present almost unknown and, by the extension of the railway through this Province to Manda on Lake Nyasa, these beliefs may easily become realities. The eventual link with the railway system of the Rhodesias would offer immense possibilities in many directions.

The Central African territories of Southern Rhodesia, Northern Rhodesia and Nyasaland have no seaboard and are therefore dependent for their access to and from the outside world on transport systems over which they have little or no control. The one notable exception to this statement is to be found in the existing facilities offered by the Beira Railway Company and the Port of Beira. The former of these two British companies, which owns the line running through Portuguese East Africa from Umtali on the Rhodesian border to the Port of Beira, is worked under agreement by Rhodesia Railways, as are all the traffic operations within the Port of Beira itself. Thus, there is at the present time a single operational control in the flow of traffic from Northern and Southern Rhodesia to the port and vice-versa. Traffic to and from Nyasaland, which also passes through Beira, is handled under somewhat similar arrangements by the Trans-Zambesi Railway and Nyasaland Railways to a point where it joins the Beira Railway, some 19 miles from the port itself.

Unfortunately, the life of these two British companies, who have for so long provided the main transport link with the outside world for Rhodesian development, and who operate under a Concession from the Portuguese Government, has reached the stage where they may be expropriated by the Portuguese Authorities. This applies at the present time to the Port Company, while the Port Railway Company has only a few years to run.

The uncertainty of the future is naturally a matter of concern to the Governments of these land-locked countries and is retarding the development of plans to provide for extensions in the port to handle increasing traffic.

During 1947, shipping was subjected to long delays at Beira due, in the main, to similar difficulties to those which existed in other East African ports and which have already been described. Happily, however, the arrival of new equipment for Rhodesia Railways, together with a programming by the Authorities of cargoes passing through the port, has led to a marked improvement in the performance of both port and railway. In addition, mechanical handling equipment to assist in the loading of chrome ore, and to be used in other directions, is now playing its part to reduce time spent by ships in discharging and loading their cargoes.

The Rhodesian railway system is connected in the south with the South African railway system and, to some extent, is linked with the main ports of the Union of South Africa, but the distances are great, with the consequent additional freight charges. Yet another link with the East coast is via the Belgian Congo and Portuguese West Africa; here the Benguala Railway terminates at the Port of Lobito Bay. For a variety of reasons this route has not been used to the fullest possible extent, but the increasing demands on every available facility may well bring it into greater use.

Yet another scheme for the opening up of these territories is to be found in a project for building a new railway across Bechuanaland from Livingstone on the Rhodesian railway system and terminating at Walvis Bay in South West Africa. This matter is still in its early stages and it is difficult to comment on the possibilities of such an undertaking in the absence of any information which a proper survey would disclose.

It is hoped that this brief outline of some of the difficulties which face African development in respect of the one vital service which it is—and always will be—dependent upon, i.e., the ports and railways, will give the reader an idea of what confronts the many plans for exploitation of these areas. To those who have studied the problems on the spot and who are aware of the potentialities of the Continent, it is clear that the speed with which any, or all, of these schemes now afoot can come to fruition, depends firstly upon the service they can be given by existing transport facilities, and secondly upon how soon the more remote and, in some cases, richer areas can be served by new developments in port and inland transport.

There would appear to be at the present time an urgent need for an examination of the problem as a whole. Clearly one of the main requirements is to arrange for the linking up of the existing railway systems. Many obvious advantages will follow from this, as a glance at the map of Africa will show. The prospect of a Cape to Cairo railway, about which so much has been written in past years, is brought, if not to a state where it is an immediate likelihood, at least to one where, by intelligent planning, it can be achieved in time, and as the future development of the Continent demands.

Ferries Improvement Report

Recommendations of Committee of Inquiry

Proposals for the improvement of thirty-two existing ferries and the starting of three new ones, figure among the recommendations of the Ferries Committee, whose report to the Minister of Transport was published at the end of last month (H.M. Stationery Office, 1s. 6d. net). The recommendations range from the provision of additional, and in some cases, larger vessels, to the installation of radar or other navigational devices on services which are liable to interruption by fog.

Long-term recommendations made by the Committee are that highway authorities should be empowered to take over, compulsorily if need be, ferries linking trunk or classified roads; that these should be treated as part of the highways and freed from tolls; and that expenditure incurred by the highway authorities on the acquisition, improvement, maintenance, and operation of the ferries should be met in part by Government grants.

The Report states that in Great Britain there are normally in operation 44 vehicular ferries, 5 of which are already free from tolls. They vary in character from pontoon and chain ferries operated by hand to vessels plying on important waterways between floating landing stages. Although a ferry is comparable with a public passenger or goods vehicle, the Committee considers that it should, nevertheless, be generally regarded as a substitute for a bridge or tunnel, until such time as a permanent crossing may be justified.

The Committee, consisting of Mr. Neil S. Beaton (Chairman), Mr. K. C. Barnaby, Sir William Halcrow, Sir Hugh Mackenzie, and Sir Douglas Ritchie, was set up by the Minister of Transport in May, 1946, to investigate ferry services linking trunk and classified roads, and to make recommendations for the improvement of their equipment and operation. During its investigations, 71 ferries were inspected, and conferences were held with about 140 operators, local authorities, organisations, and persons. The members are unanimous in their recommendations.

When publishing the Report, the Ministry stated that no decisions have yet been taken on the recommendations of the Committee, and in the present man-power and materials position it is not to be expected that the recommendations, if adopted, could be implemented at an early date.

Turn-round of Shipping in United Kingdom Ports

Summary of the Working Party's Report Recently Submitted to the Minister of Transport

A Working Party was appointed in September, 1947, to assist in improving the turn-round of shipping in the United Kingdom ports following a meeting at the Ministry of Transport under the chairmanship of the Rt. Hon. G. R. Strauss, M.P., then Parliamentary Secretary, Ministry of Transport. At that meeting, the following organisations were represented, namely, the General Council of British Shipping, the National Joint Council for the Port Transport Industry, the Dock and Harbour Authorities' Association and the National Dock Labour Board.

The task of the Working Party was "to consider measures likely to give speedy results in improved turn-round of ships in the United Kingdom ports and to initiate action or suggest methods by which improvement could be achieved," and the following is an abstract of their findings:—

CONDITIONS AFFECTING PORT OPERATIONS

It is evident that the extent of the unrepaired war damage to port installations is seriously retarding the handling of ships. The Port of London lost one-third of its covered transit and storage accommodation. At Liverpool over 50% of the sheds and dock warehouses were destroyed or badly damaged and 30% of the berths are still out of commission. Hull had one dock rendered useless and lost about 60% of its transit shed and warehouse accommodation. In Southampton 60% of the warehouses were completely destroyed. Other ports suffered heavy damage also. To this damage must be added the accumulated arrears of maintenance. Where transit sheds are inadequate, deep-water berths insufficient, quay surfaces bad and equipment old and obsolete, the working of ships is inevitably delayed and the cumulative effect is one of the major causes of poor turn-round.

The port authorities are hampered in their efforts to overcome these defects and in new development work by the shortages of labour and materials which retard much of our post-war reconstruction and by the restrictions on capital expenditure which have to be imposed in the present state of our national finances. The Working Party commend to the attention of those responsible for the administration of these controls the important saving in ships' time which can be obtained by well-directed expenditure on repairs to, and development of, our port installations, and consider that a substantial increase in the labour and materials allocated to port works is necessary.

It is important that the rebuilding of transit sheds should proceed quickly, as inadequate transit accommodation, by creating congestion, directly delays the despatch of ships.

The reconstruction of damaged warehouses in port areas or the provision of alternative accommodation is urgently required. It does not seem to be sufficiently appreciated that this lack of warehousing accommodation contributes materially to ships' delays. They therefore recommend that the reconstruction of warehouses should be speeded up, and Government Departments responsible for sponsoring and licensing this work should take into account its importance in the saving of ships' time.

The shortage of warehouse facilities has also resulted in the use of transit sheds for storage. Some importers, taking advantage of any free rent period in transit sheds allowed by the custom of the port, are slow to remove goods. This accentuates congestion, and it is recommended that port authorities should give special attention to this problem and take all possible steps to ensure the rapid clearance of goods from transit sheds.

Increased Demand for Deep-water Berths

The Report draws attention to the effect upon port operations of the war losses of medium-size dry cargo vessels and the greater number of larger ships of war-time standard design now used in their stead. There is, as a consequence, additional pressure on the available berths suitable for the larger class of ships and this makes for delay.

The tendency of traffic to concentrate on some ports, while facilities in others are not fully used, merits attention. The factors which determine the ports through which particular traffic moves are too complex to permit of any simple judgment on this trend. They consider, however, in view of the fact that some ports are working under handicaps and that there is an urgent necessity for reducing the time spent by ships in ports, pressure could be relieved if the burden of traffic through the ports was more widely spread. It is impracticable for them to make any specific recommendation on the method of achieving this result, for the conditions affecting different traffics will vary widely according to source of destination, inland transport facilities, experience and equipment in particular ports, shipping services available and the incidence of cost. Nevertheless they commend to the consideration of shipowners, and of major importers and exporters, the possibility of saving time by the greater use of ports not at present working to full capacity.

TURN-ROUND OF SHIPS CARRYING SOME IMPORTANT COMMODITIES

In the course of their investigations some special difficulties were found to be experienced in the handling of ships engaged in the transport of certain commodities, notably food, timber and iron ore. A very large amount of shipping is used for the transport of these commodities and reduction in the turn-round time of these ships would make an important addition to the effectiveness of our tonnage resources.

Food Cargoes

Some practices in the handling of food cargoes were alleged to cause unnecessary delay to ships. In particular complaints were received at a number of ports that the discharge of foodstuffs was delayed by sorting to marks on the quay and in the sheds. Accepting that sorting is necessary to control the quality of goods imported, they consider that the process should be expedited in certain instances by simpler and clearer marking, and recommend that the Ministry of Food should investigate this possibility. Greater care on the part of holdsmen in making up slings of the same mark or grade would also speed up the work.

As a result of their consultations with the Ministry of Food, instructions have been issued to Port Area Grain Committees that overtime is to be worked on grain ships where a saving of ships' time can be made, regardless of whether there is any despatch money to set off against the increased cost. As a further contribution to speeding the turn-round of grain ships, double-shift working should be introduced. It is appreciated that this will present mill and granary owners with difficult problems of labour organisation, but in view of the great saving in ships' time which would be effected and the consequent direct or indirect saving in dollars, these difficulties should be overcome.

Timber Cargoes

There are special difficulties affecting timber traffic which are liable to cause delays to ships. The bulk of the imports is concentrated into a relatively short season and congestion is apt to occur at its peak. The operations present special problems and require proportionately more labour than for other cargoes. Last season too, the volume of timber imported was much greater than in the preceding year (although still less than pre-war), so that the capacity of the ports was put under greater strain.

To ensure prompt despatch of ships the arrangements for timber imports must clearly be flexibly administered to take account of the situation in the various ports and the efficient use of port facilities and inland transport, as well as the requirements of consumers of timber. If a merchant is not able to deal expeditiously with any consignment allotted to him, barges or wagons into which the timber is discharged from the ship may be kept loaded for unnecessarily long periods with the consequence that the turn-round of subsequent ships is delayed. They were also particularly concerned that the system of allocation of cargo to merchants should not result in the assignment of ships to ports already congested or in the uneconomic cross-haulage of traffic.

Efforts were made last year to deal with difficulties of these kinds by redirection of ships from congested ports and diversion of sup-

Turn-round of Shipping in United Kingdom Ports—continued

plies. Profiting from this experience they consider that measures can be taken to improve the turn-round of timber ships in the coming and subsequent seasons.

In the first place there should be consultation between the Board of Trade, the Ministry of Transport, the British Transport Commission and the National Dock Labour Board to facilitate the preparation of the programme of imports through the various available ports, throughout the season, giving due weight to the capacity of the ports and the facilities for inland transport. Efforts were made last season to prepare a realistic programme of this kind and the contacts established should make planning more effective for the coming season.

Despite such planning, local circumstances must be expected to arise from time to time which require adjustment of the arrangements at particular ports. There should be regular meetings during the season between the organisations mentioned in the previous paragraph to keep the situation in the ports under continuous review and to concert action to relieve congestion, if it should arise. In order to avoid congestion ships should be redirected to other ports, allocations of timber should, if necessary, be diverted from firms unable to cope immediately with their deliveries and other appropriate measures for the temporary disposal of cargoes should be taken, such as block stacking on the quays.

While national planning on the lines indicated should lead to improved efficiency, it is equally important that there should be local planning to ensure proper utilisation of port and inland transport facilities and dock labour.

In preparation for the coming season and to relieve the peak burden upon the timber ports, the Timber Controller has made arrangements for stacking timber in the port areas and for extending port storage facilities. Advantage has also been taken of recent favourable conditions on the railways to clear port storage grounds in readiness for the season's arrivals.

There are some causes of delay to timber ships arising from the circumstances in particular ports. For example in London, where a large proportion of the traffic is discharged overside, timber ships suffered from the shortage of barges. Action to alleviate this shortage has been proposed.

The shortage of bolster wagons was in some ports responsible for delays to timber ships last year. More will be available this year, but notwithstanding this, shortages will occur again, especially as there is a heavy demand for bolsters to carry steel, and it is recommended that the British Transport Commission should make advance preparations to provide for timber ships expeditiously.

During the height of the season, there are liable to be exceptionally heavy demands for labour in certain ports which cannot be met through the registered labour force. The National Dock Labour Board have made arrangements for seasonal registers at these ports.

There were many different methods in use for the handling of timber and in most ports there could be considerable improvement. The worst delays seemed to occur in the unloading of timber wagons in the yards which in most ports is still done entirely by hand. There are, however, ports and timber yards where considerable mechanisation has been introduced and port authorities and other interests concerned should consider the extended use of mechanical equipment, particularly in the discharge of wagons.

Iron Ore Cargoes

Iron ore is imported through a relatively small number of ports but the turn-round of ships varies considerably from port to port and in some cases is very unsatisfactory. For instance, in the Tees in 1947 only 50% of the vessels carrying iron ore were berthed immediately on arrival and an average of about three days per vessel was lost by those awaiting berth.

In the ports where turn-round is unsatisfactory, the principal causes appear to be:

(a) shortage of hopper wagons;
(b) vessels are allocated to a particular ironmaster's wharf and often have to lie off awaiting turn at that berth, although other berths are available:
(c) many ironmasters' wharves were built to take ships drawing about 21-ft. while much of the ore now imported is carried in vessels drawing up to 26-ft. In consequence deep-draughted vessels are consistently delayed, awaiting turn for the limited number of suitable berths;
(d) the receiving capacity at works is sometimes insufficient to keep up with the discharge of the ship; this results either in wagons being used for storage or ships being delayed.

The supply of hopper wagons has improved recently and that there are just sufficient wagons to meet all demands if they are not held up on the quays or at other points. Special attention needs, therefore, to be given to the speedy handling of these wagons, particularly at the iron works.

Delays due to the causes indicated in (b), (c) and (d) above would be lessened by re-allocating cargoes between ironmasters when ships are likely otherwise to be held up. The Working Party discussed this proposal with the British Iron and Steel Corporation, who informed them that there are considerable technical difficulties in re-allocating cargoes, but that this is already done when practicable if the need arises. They also pointed out that two additional deep-water berths will shortly become available in the Tees which should considerably improve turn-round.

While noting these assurances, the Working Party felt bound to point out that the loss of ships' time in this trade is so serious and so consistent that in their view it calls for a full investigation by the British Iron and Steel Corporation and the port authorities in the light of their full knowledge of the technical considerations involved.

EQUIPMENT OF THE PORTS

Wharf Cranes

Most ports are short of modern quay cranes and the provision of adequate cranage facilities is essential. It may well be in the national interest for more cranes to be allocated for port use in the United Kingdom at the expense of exports. The Working Party therefore recommend that a programme of crane requirements covering all ports should be prepared by the Ministry of Transport, in consultation with the British Transport Commission and the Dock and Harbour Authorities' Association, with an indication of the urgency of the various requirements. This will give a measure of the home demand over the next few years for comparison with export requirements and will facilitate decisions on the allocation of materials for crane production.

Other Port Equipment

In the majority of the United Kingdom ports many operations in the docks are now performed by hand which could be partly or wholly mechanised. This would result in quicker turn-round of shipping and would relieve the men of heavy and monotonous labour.

The Working Party were impressed by the wide disparity in the degree of mechanisation of similar operations between one port and another and even between different employers in the same port. They found that port authorities and other employers, and the trade unions were agreed that in principle increased mechanisation was desirable. In practice, however, its development is hindered by the unwillingness of some employers to invest capital in plant, on which they believe for various reasons they will not obtain a reasonable return, and by the long-standing prejudice of some of the men against any innovation which, if it is to be effective, must reduce the number of men required to perform a given operation.

A pre-requisite to increased mechanisation is, therefore, to establish confidence among port authorities and other employers that machines purchased will be efficiently and economically used and among the men that such machines will genuinely improve their conditions of work. Finally, both sides must be equally confident that any scheme of mechanisation will increase the efficiency of the port. In the ports where difficulties arise greater use should be made of the conciliation machinery of the National Joint Council to resolve problems arising out of increased mechanisation.

Ship and quay working consists of a series of operations and the limiting factor in the rate of work of the whole ship is the speed

Turn-round of Shipping in United Kingdom Ports—continued

of the slowest operation. It is, for instance, quite useless to increase crane facilities to discharge cargo beyond the rate at which slings can be made up in the holds or at which cargo can be cleared on the quay or in the lighters. It will be apparent, therefore, that schemes for machanisation require close study by experts and they do not make any detailed recommendations in this report. They recommend, however, that a comprehensive review be made by a small expert team of the possibilities of increased mechanisation in the ports. This review should include a study of practices in foreign ports, and the team should include representatives of working dockers, master porters and stevedores, shipowners and port authorities.

It may prove beyond the financial powers of individual master porterage and stevedoring firms to provide all the plant required for full efficiency. This difficulty must not be allowed to interfere with the progress of mechanisation and, if it arises, port authorities should consider forming pools of equipment. This has already been tried successfully in some cases.

Port authorities are having difficulty in obtaining the mechanical equipment they require, as for many types they have to compete with other industrial undertakings. The manufacturers should be advised of the importance of the ports' needs and of their estimated requirements for the future, and the Ministry of Transport should collect the details of outstanding requirements and discuss with the Ministry of Supply means of making adequate supplies available.

Spare Parts for and Repairs to Mechanical Equipment

The difficulty of obtaining spare parts and materials for maintenance of plant is having serious result in the ports, and the Working Party recommend that the Ministries of Supply and Transport should bring the importance of the port requirements to the notice of the manufacturers. They also consider that these Departments should be prepared to assist individual port authorities in obtaining in delivery of spares where their lack is seriously affecting port operations.

DOCK LABOUR

Nationally through the National Joint Council for the Port Transport Industry, and at each port through local Joint Committees, effective machinery exists for the settlement of questions of wages and working conditions and for the joint study of proposals designed to increase the efficiency of dock working. There is also the National Dock Labour Board which, with its 21 Local Boards (on which the Employers and Trade Unions are equally represented), has the responsibility of administering the scheme of decasualisation introduced under the Dock Workers (Regulation of Employment) Act, 1946, and in particular has the duty of ensuring the full and proper utilisation of dock labour for the purpose of facilitating the rapid and economic turn-round of vessels and the speedy transit of goods through the ports.

The Employers' and Trade Unions' representatives and the officers of the National Dock Labour Board are endeavouring through these organisations to improve industrial relations and to foster that pride in the job which is essential for efficient working. Much remains to be done, however, particularly with regard to amenities and working conditions.

In this respect docks generally compare unfavourably with many industrial establishments and present a drab picture. Often the layout is not only very unattractive but does not allow of the best methods of working. Sanitary accommodation is frequently of a deplorably low standard. Feeding arrangements are not always satisfactory and the quality of the service in the canteens varies considerably. Washing facilities are in many cases quite inadequate and more drying and changing rooms are needed. It is also essential that there should be adequate industrial medical services.

These are matters which are the responsibility of the port authorities, the National Dock Labour Board and, in some cases, of the employers. The Working Party regard it as important that, in spite of the shortage of materials, every endeavour should be made to improve these aspects of working conditions and that the Ministries of Labour and Transport should assist in securing approval for the works involved. We are aware that the provision of the services outlined above will be of little value unless they are fully and properly used by the men, but there is ample evidence that the men are responding to improved conditions by the manner in which they have welcomed the welfare activities fostered by the National Dock Labour Board.

During the last few years the industry has undergone a social revolution. The casual conditions of employment which were general before the war have given place to decasualisation under which the men have reasonable security in the industry and are compensated for the inevitable fluctuations of work by attendance money payments when no work is available and by a guaranteed minimum weekly wage. In addition they receive an annual holiday with pay and also payment for statutory and proclaimed holidays. These are the benefits which the men receive but, on the other hand, there is the obligation upon each man to accept suitable employment and to comply with the agreed conditions of the industry.

Shortage of Labour

The casual system of pre-war days meant that a pool of labour was available in all the ports which could in general meet even peak demands. It is estimated that under that system the total number of dock workers, who looked to the docks for their main source of employment, was 95,000 while the present labour force is 75,000, but in comparing these figures the better utilisation of labour achieved by decasualisation and the decline in the volume of overseas imports since 1938 must be taken into account. It should be appreciated also that under casual conditions there was generally no obligation upon the man to attend regularly for work and no liability was accepted by the employer for any payment to the men during periods of unemployment. A reduction in the size of the labour force was a necessary accompaniment of decasualisation, but owing to the wide fluctuations of trade, due to seasonal and other causes, the problem of shortages of labour frequently arises and in some ports has been a cause of delay to ships. To carry the pre-war dock labour force on a decasualised basis would be extravagant both in men and money but other means are available to meet the demand during peak periods.

Shortages of dock labour can be mitigated by the readiness of employers and men to agree to transfer of labour and reasonable overtime working. In addition the National Dock Labour Board has arranged for the institution of seasonal registers to enable extra men to be employed to deal with cargoes such as timber and this should go a long way to obviate the shortages experienced last year. Moreover, the Dock Labour Scheme allows of non-registered labour being employed during peak periods and the careful exercise of this power by the Local Boards will materially help.

The Working Party consider that at each port there should be an organisation to advise on the allocation of labour during peak periods, and recommend that in future the work should be undertaken by the Port Operations Consultative Panels. These Panels would have no legal powers but would function by general consent.

The criticism was made at some ports that the present Advisory Committees tended to be too rigid in determining priorities and were inclined to declare the whole vessel as being first or second on turn. A more effective use of the labour force would frequently be obtained if only the controlling hatches of a vessel were manned on the first day or two. The labour so freed could be used on other vessels which might be expected to complete discharging or loading in that time and then be available for the non-controlling hatches of the original vessel on the second or third day.

Late Starts, Early Finishes, etc.

At many of the ports complaints were made regarding late starts, early finishes and prolonged or unauthorised breaks at mid-morning and mid-afternoon for refreshment. In certain instances the complaints were due to, or encouraged by, organisational causes, such as delays in service at canteens or transport difficulties, and the Working Party were able to suggest lines upon which improvement could be secured; but in other cases there was no legitimate excuse for the slackness. Endeavours have been made

Turn-round of Shipping in United Kingdom Ports—continued

by exhortation to get better time-keeping, but the problem can only be solved by proper supervision and concerted measures by employers and their officers and foremen, with the active support of the local Joint Committees. It is useless for one employer in a port to endeavour to get strict time-keeping if other employers and their foremen connive at the evil.

They were glad to observe that at one large port where the problem had been vigorously tackled, late starting, early finishing and similar abuses had been completely eliminated and the output of the men increased.

One excuse for bad time-keeping was that, as the men were on piece-work, any loss of time was in effect paid for by themselves out of their piece-work earnings; but if the men work the full hours they will advance the national interest by speeding up the working of the vessels and incidentally increase their own earnings.

Mechanisation and Piece-Work

They referred earlier in the report to the need for increasing mechanical appliances and for the study of new methods of handling cargo. Allied to these questions is the problem of piece-working and, although much of the work is already done under these conditions, there is scope for extension and improvement. This is a matter for the Employers and Trade Unions jointly to consider. With goodwill and mutual trust between the parties there should be no insuperable difficulty in determining fair manning scales when mechanical appliances are used. It is obviously in the best interest of the men that the more laborious work should be done, as far as practicable, by machines and that our ports should be able to offer as good a service to ships as can be obtained anywhere in the world.

Night Shift Working

In present circumstances, while we have too few ships and inadequate berths, it is essential that the best use should be made of our limited resources. Yet at some ports discharging and loading of vessels proceed only during day hours. The extension of night work with fresh gangs would enable the valuable assets represented by ship and shore appliances to be used for longer periods and would expedite the turn-round of the vessels. They accordingly recommend for the consideration of the local Joint Committees that provision should be made for the adoption of night-shift working with fresh gangs at the ports where this system (or two-shift working) is not at present in operation and that full use should be made of this facility, wherever practicable, to speed the turn-round of ships. It would not, of course, be necessary for the ships to be manned as fully at night as in the day. For example, it would be sufficient to man at night the controlling hatches which determine the ultimate finishing time of the vessel.

Tallying Arrangements

Many complaints were received regarding the inefficiency of the tallying arrangements and there is undoubtedly some justification for them. They therefore recommend that the National Dock Labour Board should institute a training scheme with adequate tests before men are allowed to work as tally clerks and the Board should also consider the question of men being specially recruited as tally clerks subject to the general provisions of the Dock Labour Scheme.

STATISTICS OF PERFORMANCE AND CO-ORDINATION OF OPERATIONS

In conclusion, the Working Party state: " Our review of the conditions in the ports shows that they are still working under serious disabilities. Some of these are liable to persist for some time, until the shortages of materials, labour and equipment can be overcome. Meanwhile it is essential that the maximum efficiency should be extracted from the resources at the disposal of the port authorities in terms of turn-round of ships. We believe that in this task the authorities responsible for the working of each port would would be greatly helped by improved statistical records specifically designed to enable them to measure any increase or decrease in the efficiency of performance of the various essential operations. We have formed the opinion that existing statistical records are, generally, inadequate for this purpose. Shipowners record for their own purposes details of output and time spent in port in respect of their vessels, but in few ports is this information available to those responsible for the administration of the port. We recommend that each port authority should give urgent consideration to the compilation of current operating statistics in the form appropriate to local practice and circumstances. They should be regarded as comparable with the production figures of an industrial undertaking and be constructed so as to reveal the daily progress of each vessel, with particulars of gangs employed on board and ashore; hours worked and hours paid for; tonnages of goods discharged or loaded by each gang; and distinguishing the principal commodities and causes of delay. They should show the total time of each ship in port and the occupancy of berths and enable the progress of every ship to be checked from the time of her arrival until she leaves the port."

" Statistics such as these will form a firm basis for planning of port operations, reveal delays and facilitate remedial action. We also attach great importance to arrangements in each port for securing from those concerned with its operation and use their willing co-operation in planning and carrying out measures to remove causes of delay. In their report on the Port of London our team recommended that an organisation be constituted for these purposes and the Port Authority has secured the collaboration of the interested organisations in a Port Operations Consultative Panel. We recommend that each port authority should constitute a similar body for this work, representative of all interests in the port, including Shipowners and other employers of dock labour, Trade Unions, the National Dock Labour Board, and appropriate trading organisations."

" It is obviously necessary at all times that the port industry should work with the maximum efficiency. In current circumstances, however, it is a matter of vital national concern that ships should be discharged or loaded expeditiously. Our recommendations are aimed to assist the port authorities and the other organisations in the industry to carry out this duty."

" We heard much about restrictive practices in the sense that the term is loosely used to indicate unreasonable impediments to efficient working. We are satisfied that there is substance in some of the complaints as regards both sides of the industry and that the practices in question adversely affect the turn-round of vessels. Machinery exists within the industry to resolve problems of this kind and we urge that it be promptly and fully utilised to this end."

" In his recent budget speech, the Chancellor of the Exchequer put a high value on the contribution made by our ships to our external balance of payments but was forced to add the comment that the figure would have been much higher if our fleet had recovered its pre-war tonnage. One way of assisting to make good for this purpose the losses inflicted on our merchant shipping during the war is to improve the performance of the ships we possess. In this way resolute working in our own ports can help in overcoming the serious effects upon our national economy of the shortage of ships."

" The necessity for increasing our exports and economising in what we must import from abroad has been brought home to every citizen by the Government. It should inspire all parties in the ports in the achievement of the maximum efficiency throughout all their operations, whether they are matters of port organisation or of human effort, if all have constantly in mind that every hour gained in dispatching a ship adds directly to the potential earnings of the nation in foreign exchange. We rely on all the national organisations associated with the turn-round of shipping in port to bring home to their individual members the importance of their contribution."

Dock and Harbour Authorities' Association.

The Dock and Harbour Authorities' Association, 7, Victoria Street, London, S.W.1, announce that in consequence of the retirement of Mr. W. Ashley Cummins as from June 30th, Mr. L. H. J. Horner has been appointed secretary of the Association with effect from July 1st. The address remains unchanged, but the new telephone number will be Abbey 3567.

PORT OPERATION

Part 18 of a Series of Articles by A. H. J. Bown, M.Inst.T., A.C.I.S., and Lieut.-Colonel C. A. Dove, M.B.E., M.Inst.T.

(Continued from page 51)

(10) Inland Water Transport

The standard textbook on inland water transport in Great Britain is "Canals and Inland Waterways," by Cadbury & Dobbs (Sir Isaac Pitman & Sons, Limited, 1929). Students are referred to this valuable work for full information on the subject. In recent months, a stimulating series of articles by Mr. C. T. Gardner, A.M.I.C.E., M.Inst.T. (late Deputy Director of Canals, Ministry of Transport), entitled "Outlook for Inland Water Transport," has appeared in "Modern Transport"; and another important contribution to the study of this question was the paper by Mr. W. Fraser, M.Inst.T., Secretary and Traffic Manager, Trent Navigation, read before the East Midlands Section of the Institute of Transport in December, 1946, and published in the Institute Journal for July-August, 1947. Yet another valuable summary of the general position of British canals was the paper read at Leeds in November, 1946, by Mr. R. H. Hunt, M.Inst.T., Managing Director of John Hunt & Sons (Leeds), Limited. Extracts from Mr. Hunt's lecture—which was entitled "Introduction to Inland Waterways"—appeared in the Institute Journal for March/April, 1947. The following notes are no more than a summary of the salient facts and figures relating to inland water transport and they are largely based upon the works of the above-mentioned authorities, to whom grateful acknowledgment is hereby made.

The Existing Waterways

The canals and navigable rivers of Great Britain amount altogether to about 3,865 miles of waterway. The main routes lie across England in the shape of a diagonal cross connecting Bristol with Hull, and London with Liverpool, with additional important routes running over the head of the cross between the Mersey and the Humber, plus a network around the Midlands where the two diagonals intersect.

The total of 3,865 miles of canals, canalised rivers and navigations, is made up as follows:—

	Miles.
Canals and Canalised Rivers:	
(1) Former railway-owned or controlled ...	1,233
(2) Non-railway-owned	1,333
Rivers and Navigations, not included above ...	1,263
Manchester Ship Canal	36
Miles ...	3,865

Traffic figures are difficult to state, principally because in all existing tables the same ton of goods is liable to be reckoned more than once owing to passing through the hands of two or three different bodies.

However, the following leading figures have been previously publicised and, inaccurate as they may be in themselves, the comparisons at least have a certain value:—

Total Tonnage Conveyed on British Canals.

Year.	Tons.
1888	35,301,857
1898	36,011,241
1905	34,136,767
1913	31,585,909
1918	21,599,850
1925	20,217,841
1926	17,349,726
1927	20,023,889
1938	14,064,000*
1943	11,981,870*
1946	10,914,300*

* Exclusive of Manchester Ship Canal.

The Transport Act, 1947

In reading the following notes, students will, of course, bear in mind that to a very large extent they must now think about British inland water transport in the new light of national ownership. By the operation of the Transport Act, 1947 (Part II, Sec. 12 and the Third Schedule, Part II), the properties of the following canal and inland navigation undertakers were transferred to a new public authority, namely, the British Transport Commission, with effect from the 1st January, 1948:—

The Undertakers of the Aire and Calder Navigation.
The Sheffield and South Yorkshire Navigation Company.
The Aire and Calder and River Don Navigations Joint Committee.
The Company of Proprietors of the Birmingham Canal Navigations.
The Company of Proprietors of the Calder and Hebble Navigation.
The Company of Proprietors of the Coventry Canal Navigation.
The Grand Union Canal Company.
The Leeds and Liverpool Canal Company.
The Lee Conservancy Board.
The Lord Mayor, Aldermen and Citizens of the City of Nottingham (in respect of the Trent Navigation undertaking).
The Oxford Canal Company.
The Severn Commissioners.
The Sharpness Docks and Gloucester and Birmingham Navigation Company.
The Staffordshire and Worcestershire Canal Company.
The Company of Proprietors of the Stourbridge Navigation.
The Trent Navigation Company.
The Weaver Navigation Trustees.
The Company of Proprietors of the Herefordshire and Gloucestershire Canal Navigation.

Under a scheme made by the Commission and approved by the Minister of Transport (Sec. 5 (4)), the Commission has substantially delegated its functions in respect of canals and inland navigations to one of its five assistant public authorities, namely, The Docks and Inland Waterways Executive.

The 18 undertakings scheduled in the Transport Act as above-mentioned, and now under the control of the Docks and Inland Waterways Executive, do not include the 1,233 miles of former railway-owned or controlled canals or canalised rivers. These have been delegated by the Transport Commission to the Railway Executive, but it is understood that they will shortly pass under control of the Docks and Inland Waterways Executive and will be integrated in the new Divisional organisation which has been set up by that Executive.

The four Divisions are devised geographically (excluding Scotland) and comprise a North Eastern, a North Western, a South Western and a South Eastern Division. For the present, the Caledonian and Crinan Canals will continue under the existing local arrangements for maintenance and operation.

Clearly, this far-reaching measure of unified control opens up new possibilities of great importance. Some further reflections on this aspect of the matter will be found later in these notes; but it will be useful to have this recent great change continuously in mind when looking through the paragraphs on origins, construction, development and operation which immediately follow.

Origins

Canals were not unknown in classical times, but in Europe the pioneers were the Dutch, in the twelfth century. About two hundred years later the Italians invented locks, and, by the end of the seventeenth century, Holland, Flanders, Germany and France had canal systems.

At this period British transport was based on the coastwise sea route, the navigable rivers and the packhorse and the water route

Port Operation—continued

was the most used. It was better to send goods from Newcastle to Nottingham by way of the North Sea and the River Trent than to attempt the Great North Road. Even in good weather the roads were bad and, in winter, wheeled traffic could not proceed at all. The normal speed by road was about 25 miles a day.

With the important exception of the Manchester Ship Canal, practically all the canals in Britain were constructed in the seventy years from 1760 to 1830—the period of the Industrial Revolution. The early canal undertakings flourished exceedingly. The reason was that British industry had become remarkably geared up in every respect, save one, efficient transport. Artificial waterways supplied the long-awaited answer and the canal boom began.

The first Act authorising a modern canal was passed in 1755. The canal itself—the Sankey Brook Navigation from St. Helens to the Mersey—was completed in 1768.

In 1759, the Duke of Bridgewater obtained powers from Parliament to construct his famous canal from Worsley to Manchester. The canal was opened in 1761 and, immediately, the householders and industrialists of Manchester began to get coal from Worsley more cheaply and more abundantly than ever before.

Leaving Bristol Docks for the Midlands.

By 1767, the canal had been continued to Runcorn, and by 1776 locks had been constructed to take the new waterway down to the tideway. The Duke spent £220,000 and made a large fortune. The engineer was Brindley, a self-taught man of great genius and courage.

The next big move was the construction of the Trent and Mersey Canal (the Grand Trunk). The Earl of Gower sponsored the scheme, with Brindley advising. The Act was obtained in 1766 and work began at once. The route is Preston Brook (Bridgewater Canal), Cheshire, the Staffordshire Potteries, along the Trent Valley to Derwentmouth (River Trent), and thence by the river through Nottingham, Newark and Gainsborough to the Humber. Industrialists and householders began to get much cheaper food and coal, and the raw materials and products of industry moved freely and efficiently for the first time. The community benefited all round and the standard of living rose remarkably.

The undermentioned further canals quickly followed:—

The Staffordshire and Worcestershire Canal (1772) from Haywood on the Grand Trunk to Stourport on the Severn. This joined the Midlands to Bristol.

The Coventry Canal (1778) from Coventry to the Grand Trunk.

The Oxford Canal (1790) from close by Coventry through Rugby and Banbury to Oxford.

Birmingham Canals (about 1790) joining Birmingham with the Trent and Mersey Canal; with the Oxford Canal via Warwick; and with the Severn near Worcester.

Leeds and Liverpool Canal (about 1790) joining the Mersey to the Humber; the route is Liverpool, Wigan, Blackburn, Skipton, Aire and Calder Navigation.

Manchester, Rochdale and Huddersfield
Manchester and Bolton
Kendal and Lancaster
Barnsley and Chesterfield
} about 1790.

The Thames and Severn Canal (1775-1789) from the Severn at Framilode to Stroud; and later from Wallbridge on the Stroudwater Canal to Lechlade on the Thames.

The Kennet and Avon Canal (about 1790) from Bath on the Avon to Newbury on the Kennet.

The Wilts and Berks Canal from the Thames at Abingdon to the Kennet and Avon Canal at Semington with a branch to the Thames and Severn Canal at Cricklade.

The Grand Junction Canal (Act obtained in 1793, work completed in 1805) joined London to the Birmingham district and afforded communication with Nottingham, Loughborough, Leicester and Northampton. The route is from Braunston (Northamptonshire) on the Oxford Canal through Fenny Stratford, Rickmansworth and Uxbridge to the Thames at Brentford.

The Regents Canal (1812-1823) from the London Docks through Stepney, Mile End, Old Ford, Islington, King's Cross, Regents Park and Paddington to join a branch of the Grand Junction.

The Gloucester and Berkeley Ship Canal (1793-1827) from Gloucester to Sharpness, substituted, for a difficult river navigation, a level waterway able to pass a vessel carrying 1,200 tons and reduced the length of the route from 28 miles to 16½ miles.

The Shropshire Union (completed 1830) linking the Mersey with Chester, Nantwich, Ruabon and Whitchurch, by means of the Ellesmere and Chester Canal; and also connecting the Mersey with the Birmingham system by a junction near Tettenhall on the Staffordshire and Worcestershire canal.

The Basingstoke Canal
The Thames and Medway Canal
And many isolated canals and small branches
} Some of which were not successful financially.

SCOTTISH CANALS

The Caledonian Canal is a series of canals and navigable lochs. The lochs account for 37 miles out of the total length of 60 miles. It joins Inverness to Fort William and offers vessels an alternative to the stormy north-about route. It was opened in 1822.

The Crinan Canal is 9 miles long and shortens by about 70 miles the voyage from the Clyde round the Mull of Kintyre to the west coast.

The Forth and Clyde Canal (1768-1790).

The Edinburgh and Glasgow Union (1817-1826) from near Falkirk on the Forth and Clyde to Edinburgh.

The Monkland (constructed under an Act of 1770) is a branch of the Forth and Clyde and runs from the Monkland Collieries to Glasgow.

The New Canals and the Old Navigations

Canals were slow in coming to Britain, but when they came they developed rapidly. The initiative sprang almost entirely from private enterprise. The enterprisers were at first individuals and later joint stock companies. The new mode of transport had to link up successfully with an older system—the navigable rivers. The latter were commonly controlled by public bodies of Navigation Commissioners. Full co-operation came only slowly and was often preceded by much disputation and mutual complaining. The old records have much to say of neglected rivers, silting up, high barging charges, blocked channels, illegal tolls and even highway (or riverside) robbery.

But the middle of the 17th century saw the beginnings of better things. The Stratford Avon, the Bristol Avon and the Don were all improved for navigation about this period. During the next hundred years much more was planned and some of it—but not

Port Operation—continued

much—was accomplished. But in the 19th century substantial improvements were carried out, particularly on the Severn, the Aire and Calder, and the Weaver.

Early Characteristics and Later Difficulties

Before passing on to the later history of the British canal system, it may be well to note certain features which were present in the early stages and which have left their mark upon our inland waterways as they exist to-day. The chief of them may be briefly summarised as follows:—

(1) There were many different, independent owners, and they often pursued mutually hostile policies.
(2) There was no national gauge—the canals varied in width, lock dimensions, size of tunnels and headway under bridges.
(3) Transhipment was frequently necessary, and there were no through tolls.
(4) The early years were full of haste and public excitement; in consequence, there were some cases of poor construction, bad management, ill-devised schemes, inferior routes and under-estimating of capital cost.
(5) Little attempt was made by the carriers to adhere to regular time-tables; there was great uncertainty about charges; and there were no through rates.
(6) In winter, stoppages arose through ice or floods, and, in summer, drought could interfere with traffic.

The Early Operational System

Generally speaking, the canal owners were prohibited from acting as carriers themselves. This rule was not entirely universal in application, but, in the main, the barges were owned and operated by firms of carriers who paid tolls to the canal owners. In addition, certain ironmasters, timber merchants, corn dealers and the like, worked their own canal barges with freights of raw material and manufactured products.

The pulling power was the canal horse and his track was the towpath alongside the canal. There was an express service and an ordinary service. The express service kept moving day and night with four men to a 30-ton boat and fresh horses at necessary intervals; the average speed was rather better than 3 miles an hour and one horse averaged 20 miles a day. In the ordinary service, two men (or a family living on board) worked a one-horse boat carrying 20 tons through the day and tying up at night, averaging 25-30 miles in every 24 hours. The express service cost about one penny per ton/mile and the ordinary service about one half-penny. Land carriage cost about twice as much as the waterway and sometimes three or four times as much. The road route and the canal route worked out about equal in point of time taken. As compared with the river navigations, the canals were independent of wind and tide, but liable to be iced up in winter. But they had a great day and contributed substantially to the development of heavy industry, the increase of inland populations, the uprise of certain seaports, and a better average standard of living. But away in the North of England, round about the year 1830, men like George Stephenson and George Hudson were at work and the dawn of the Railway Age was at hand.

The Coming of the Railways

Between 1830 and 1840 railways were put down along practically all the principal canal routes. Canal charges were drastically reduced to meet the new competition, but the drain on traffic was very great and the value of canal shares fell steeply. But although the blows dealt to the canal system by the new-born railway were severe, they were not mortal; the older form of transport has survived and is in many ways very much alive to-day. Competition has brought out its defects and its qualities, and it is to the study of these that the student will doubtless wish to turn his mind.

The Railway Companies and the Canals

In the 1840's many canals passed under railway control. There were amalgamations, leases, purchases and guarantees. About one-third of all the U.K. waterways were thus affected. The Railway Companies maintained some of these canals and abandoned others. Later in the century, a number of Acts of Parliament were passed with a view to arresting the decline of the canals and enabling them to earn reasonable revenues. The student is referred in particular to The Railway and Canal Traffic Acts of 1854, 1873, 1888 and 1894. Little good appears to have followed this well-meant legislation. From 1888 to 1905 canal traffic remained about stationary in volume, whilst rail traffic increased by 64 per cent. But, about the turn of the century, the trading community observed with apprehension that rail rates were tending upwards and there were many people who began to ask for the revival of the canals to accommodate their bulk traffic. In 1906 a Royal Commission, under Lord Shuttleworth, was set up to investigate the matter.

The Shuttleworth Report, 1906-1909

The main recommendations were:—

(1) That a "Waterway Board" be created, financed as necessary by the State, to acquire and administer such canals as might be found expedient, whether rail-owned or otherwise.
(2) That the routes forming the "Cross"—that is the Thames/Mersey, Humber/Severn diagonals—should be tackled first, consisting of 533 miles of main line and 371 miles of branches. Other routes should be taken in hand later.
(3) That the improved canals could not be expected to make profits, but that industry would benefit by an alternative form of cheap transport, and therefore the public welfare would be advanced.

The members of the Commission were not unanimous and public reception of the weighty majority Report was apathetic. When war broke out in 1914, the state of British canals was much the same as it was in 1850.

The War of 1914-1918

A large measure of Government control was applied to British canals during the first world war. Excellent use was made of the waterways and a certain amount of essential maintenance and repair was carried out. The efficiency of the inland water route, within its own characteristic limits, was amply demonstrated.

Report of the Chamberlain Committee, 1921

When the war ended in 1918, unified Government control ceased and the canals reverted to their independent, pre-war organisations. The old struggle for survival had to be resumed and great difficulties were experienced. The Minister of Transport set up a Committee of Enquiry under Mr. Neville Chamberlain to consider the feasability of a canal improvement plan on a more limited scale than the Shuttleworth scheme. The Committee recommended that the canals of England be welded into seven regional groups, each group to be placed under a public trust, and that each trust should have power to purchase land compulsorily, widen waterways and construct works, and also be permitted to function as carriers on the canals in its group.

The Report was highly informative and well-conceived, but it was not implemented. Nevertheless, many projects for canal improvement have since been put forward and two important ones have been carried out. New locks have been constructed and extensive dredging carried out in the neighbourhood of Newark, to the great betterment of traffic conditions on the River Trent system, and, in 1929, the Grand Union Canal Company was formed to amalgamate five separate undertakings, thus bringing under one control nearly 150 miles of main waterway between London and Birmingham and a further 90 miles of branches.

Developments Since 1921

One great factor in the carrying industry between the wars was the great advance of road transport. To many minds, the commercial development of the petrol-driven road vehicle was another deadly blow at any hopes of a canal revival. Others thought in terms of the scientific co-ordination of road, rail and water, and

Port Operation—continued

have continued to believe that the waterways have an imporant contribution to make.

The 1930 Royal Commission on Transport again put forward the notion of amalgamation of canals under public trusts and urged the Minister of Transport to act himself if voluntary agreements could not be secured.

In the war of 1939-1945, the canals again came under the emergency control of the Ministry of Transport. Most effective use was made of them in the abnormal circumstances of the strenuous years when the nation's traffic constantly exceeded the combined capacity of all arms of inland transport. Both the canal operators and the carriers made stupendous efforts, which contributed substantially to the needs of the time and earned the highest praise.

General view of Redstone Wharf, Stourport.

The Special Problems

It may be useful for students to have before them, in a short summary, the questions which appear to require solution in connection with British inland waterways as they exist to-day. According to the recorded opinions of those in a position to know, the chief points demanding consideration are the following:—

(1) Certain waterways require straightening and, in other cases, locks require widening and deepening.
(2) Many canal banks are unprotected, involving (a) the loss of water and (b) silting.
(3) The difficulties of the past have resulted in cases of poor maintenance, accentuated by high costs and shortages of timber and steel.
(4) Recommendations of Commissions and Committees have not, generally speaking, been carried out.
(5) The decline in prosperity has discouraged some experienced carriers; and increased operating costs have made it difficult for others to compete against rail and road.
(6) The diversity of gauges has discouraged through traffic.
(7) The diversity of control has, in times past, involved many independent organisations all requiring some return from the available traffic.
(8) Mining subsidence has damaged waterways, banks, locks and tunnels, and repairs are costly.
(9) There has been no guaranteed continuity of service owing to (1) ice; (2) uncertainty of water supply; (3) bank slips; and (4) floods.
(10) Inadequate dredging has resulted in an extravagant use of engine-power and consequent diminution in pay-load.
(11) There is need for thorough research into barge designs.
(12) There is room for a continuous exchange of ideas between canal engineers and also between canal traffic operators in the new circumstances of nation-wide, unified control.

Craft, Crews and Systems of Traction

Before 1914 the typical canal craft was the horse-drawn wooden barge. About that time the steam tug was replacing the horse. In these days the craft are largely of steel construction and are either self-propelled by a diesel engine or are towed by a craft so fitted. These boats are often worked in pairs by three people—not uncommonly by a man, his wife and their son.

Other traditional methods of getting along include bow-hauling (haulage by men); sailing; drifting with the tide or stream (using the long oar as a rudder); and "legging" (men getting a boat through a tunnel by lying on their backs and pushing with their feet against the walls or roof).

The artificial canals—as distinct from rivers and estuaries—are commonly divided into wide canals and narrow canals. The classification depends upon lock dimensions, not width of waterway. The narrow canals can take boats with a beam of 7 feet carrying up to 30 tons. The wide canals have a great range—from 45 tons on a beam of 14 feet up to the ocean liners which navigate the Manchester Ship Canal.

Conditions on inland waterways vary widely. One example, among several, of modern enterprise and efficiency in this field is that of the Trent Navigation. The new locks, weirs and special dredging undertaken near Nottingham in the years 1921-28 have made it possible to pass 520 tons of cargo through the locks at one pen. The locks are 200 feet by 30 feet and can take one power boat (100 tons cargo) and three dumb boats (each with 140 tons cargo) at one locking. These standard Trent boats can operate between the Humber and Nottingham, and they work in Hull as dock lighters, receiving or delivering cargo alongside ocean steamer.

There is no national manning scale, but the number on a power vessel is often two—a captain and an engineer-mate. Dumb barges towed by tugs for short distances—out and home in the day—sometimes have one man only. In an estuary, every craft must carry a crew of two. Crews discharge, load, navigate and, when laid by, carry on with simple maintenance.

On estuaries, a man needs five years' experience, sailing as second hand on a particular waterway before taking charge of a craft. Wages compare favourably with those in other arms of transport and are regulated by Joint Industrial Councils. The life is a good one for handy men with commonsense, especially for the type of man who likes running his own job in the open air. Those who start early in life seldom leave the boats.

There are probably about 5,000 boatmen at work on British inland waterways, making, with their wives and childen, a total of about 12,000.

The Special Advantages of the Inland Water Route

It may well be that, under the Transport Act, we are about to witness in this country the progressive implementation of a programme of waterway reform and revival—a programme without excesses or wild experiments, but carefully thought out as part of a scientific scheme of national transport. If this is coming, it will be because the sponsors are convinced of certain advantages which attach to the water route. Among these, the following are undoubtedly included:—

(1) It is cheap.
(2) It is silent.
(3) It is comparatively accident-free.
(4) It relieves congestion on rail and road.
(5) It directly connects the ocean liner with the inland wharf, warehouse or factory.
(6) It is especially suitable for low-grade, bulk traffics, which are, by contrast, especially unsuitable for road or rail.
(7) It is smooth-running and therefore especially suitable for certain fragile traffics.
(8) It is, for great distances, an isolated route and therefore especially suitable for dangerous cargoes, e.g., petrol, explosives.
(9) It is light on man-power, at a time when man-power is very precious.

Port Operation—continued

(10) It is light on mechanical equipment, in an era when we want to sell machinery abroad rather than use it up at home.
(11) It can be co-ordinated most efficiently with road transport (for canal-head collection and distribution), especially by the use of well-equipped wharves, pallets and containers.

Operational Organisation

The carriage of traffic on British canals is conducted in one of three ways. These are:—
(1) By the owners of the canals; or
(2) By independent carriers; or
(3) By industrialists or merchants acting as their own carriers.

Whoever carries the traffic, the waterways are available for use by anybody on payment of the authorised tolls.

Prior to the passing of the Transport Act, interesting examples of double or treble-functioning were not uncommon. For example, a Company could be, and was: (1) a Railway Company; (2) a Canal-owning Company; (3) canal carriers; and also (4) frequent users of private canal carriers' services on its own canals in co-ordination with traffic to or from its own Railway.

Amongst principal canal companies also acting as canal carriers may be mentioned the Trent Navigation Company, the Aire and Calder Navigation and the Manchester Ship Canal Company.

Canal carriers—and canal companies when they are also carriers—often combine the additional functions of warehouse-keeping, stevedoring, and a certain amount of road haulage.

The actual traffic operational system has always been marked by a certain simplicity compared with the more complex organisation required by other forms of transport. Strict regulation of traffic is sometimes employed for passing through locks, and the negotiation of one-way tunnels is necessarily systematised. Some carriers have aimed at regular time-tables, and a degree of careful organisation is required over waterways where steam tugs regularly draw long trains of boats belonging to different owners.

The principal departments of a canal-owning Company (as such) are the Secretary's and the Engineer's: and a carrying Company usually divides into General Manager's Department (administrative, secretarial and commercial), Engineer's Department (maintenance of craft and appliances) and Traffic Department (operating).

Definitions and Miscellaneous Notes

Three Types of Waterways:

(1) Open rivers, including estuaries, e.g., the Thames up to London.
(2) Canalised rivers or navigations, e.g., Trent, Severn.
(3) Canals, e.g., the Trent and Mersey Canal.

Changes of Level are overcome by: (1) Locks; (2) Vertical Lifts; (3) Inclined Lifts; (4) Weirs or Staunches (on rivers only).

Locks are the most common. A series of locks is known as a flight. A pair of locks, side by side, is sometimes provided: boats can ascend and descend simultaneously and, by passing water from one lock to its fellow, the loss of impounded water can be halved.

Lifts are fitted to cope with big changes in level. They cost more than locks, but are swifter in use and lighter on water. The power is often a combination of gravity and electricity.

On rivers, an opening (or water-gate) is sometimes provided for the passage of boats through a weir; by temporarily penning back the water of the weir, a common level is achieved to enable the boat to get up or down.

Water Supplies require particular attention at the summit level: if the highest point is continuously and adequately supplied, all will be well at the lower levels. Sources of water include:
(1) Rivers, streams and springs—by direct flow into the canal.
(2) Rainfall gathered at high or low levels and passed into the canal by gravitation or pumping.
(3) Overflow and surplus water from locks, stored in reservoirs and brought back by pumps or gravity.
(4) Pumping from mine-workings, wells or rivers.
(5) Pumping water back from the lower levels of the canal itself to the higher reaches.
(6) Purified effluent.

Tunnels.—The first canal tunnel in England was the Harecastle Old Tunnel, on the highest stretch of the Trent and Mersey Canal: it is over 1½ miles in length and was commenced by Brindley in 1766. There are 45 canal tunnels in England and Wales of a length exceeding 100 yards.

Embankments.—There are many canal embankments (and many cuttings) in Britain, especially in the Midlands. The object is the same as with railways—to maintain level wherever possible or to restore it (e.g., following subsidence). Clay puddle lining is a usual feature.

Aqueducts carry canals across river valleys. A noteworthy early example took the Bridgwater Canal over the River Irwell at Barton. It was built of stone; it was 600 feet long and 36 feet wide; the waterway was 18 feet wide at the top and 4½ feet deep. It was replaced in 1893 by the existing swing aqueduct over the Manchester Ship Canal. Other examples are at Lancaster, Chirk and Pontcysyllte.

Shafting is an alternative to "legging" through tunnels. The man stands up instead of lying down and uses a pole instead of his legs.

Manchester Ship Canal.—This unique and wonderful undertaking was embarked upon in order to bring ocean vessels to Manchester. A few of the principal facts and figures are summarised below:—

Opened for Traffic	...	1894.
Tonnage in first year	...	925,659 tons.
,, ,, 1926	...	6,830,879 tons.
,, ,, 1947	...	6,959,988 tons.
Owners and operators	...	The Manchester Ship Canal Company (containing on its Directorate a majority representation from the Manchester Corporation).
Length	...	35½ miles.
Depth	...	Eastham to Stanlow Oil Docks, 30 feet, Stanlow to Manchester Oil Docks, 28 feet.
Bottom width	...	120 feet (over greater part of course).
Route	...	From the Mersey at Eastham (25 miles from the Mersey Bar), Ellesmere Port (terminus of the Shropshire Union), Weston Point (termination of Weaver Navigation), Runcorn (where Bridgwater Canal terminates), Latchford, Manchester.
Locks	...	Two at Eastham (largest is 600 feet by 80 feet); four other sets (two locks to a set; large, 600 feet by 65 feet; small, 350 feet by 45 feet); and two side locks to River Mersey.
Normal headroom under fixed bridges	...	72 feet.

In addition the Manchester Ship Canal Company own the Bridgwater Canal.

Capital Expenditure	...	£20,260,000.

Canal Finance.—A few leading facts, figures and estimates (quoted from the authorities already mentioned) are set out below, but students are warned that they are subject to various qualifications and should only be used after full reading of the authorities themselves:—

Port Operation—continued

(1) Total paid-up Capital of British waterways in 1905 ... ... £47,550,769
(This figure includes £19,475,460 in respect of the Manchester Ship Canal and its subsidiaries.)

(2) Capital cost of one mile of canal (based on above total £10,175

(3) One year's expenditure (1905) on British canals (including all canals of commercial importance):—

As canals owners	£919,103
As carriers	£652,157
	£1,571,260

(4) One year's revenue (1905):—

From tolls	£850,582
From freight as carriers	£826,115
From other sources (e.g., warehousing and rent of land) ...	£404,855
	£2,081,552

A modern type of Lighter on the Severn.

(5) **Tolls** are levied on a mileage basis and according to the classification (based on value) of the goods carried. The private Acts of the Canal Companies specified maximum tolls. Tunnels and locks sometimes involved extra charges. Special rates were frequently quoted. Doubtless the new national ownership with regional organisation will be reflected in some re-shaping of the tolls structure.

The Future

The authorities quoted at the beginning of these notes have all looked forward into the future of transport in this country and they have all concluded, in one way or another, that the inland waterways have an important part to play. But they are agreed that, first of all, certain measures are urgently necessary. The following is a summary of their principal conclusions:—

(1) There is a strong case for the overhaul and improvement of British inland waterways, but no case to-day for the large-scale scheme put forward by the Royal Commission of 1906-09, which envisaged, inter alia, standard boats of 300-tons capacity.

(2) There is an especially strong case for the development of such inland waterways as can be improved, at reasonable cost, up to the standard of being able to take estuarial boats of 100-tons capacity. It may well be that the day of most other canals is done.

(3) The "Cross" Scheme should have early and earnest attention with a view, if found feasible, to bringing it up to the 100-ton standard, from London to Liverpool and from Bristol to Hull.

(4) Nevertheless, it must be recalled to mind that the inland waterways of Britain were laid down on a regional basis. Objective examination, in modern conditions, may therefore finally prove that a great national canal system, with long through-routes, is out of the question. Britain is a small and hilly island; Continental conditions do not apply: the appropriate British solution will probably be to make the inland waterways capable of functioning efficiently on an area basis.

(5) Out-moded waterways should be abandoned, but regard must be had to all the circumstances. In particular, a waterway should not necessarily be closed down because it is itself unremunerative—it may be a valuable potential traffic feeder to another waterway.

(6) Taking always a new nation-wide view, there should now be progressive attention by canal engineers to (a) mechanical plant; (b) bridges; (c) mining subsidence; and (d) water supply.

(7) With a similar, new, all-embracing outlook, canal operating experts should now review traffic control, stores, warehousing, and co-ordination with road haulage, railways and seaports.

(8) More dredging plant is urgently necessary and an early start on a comprehensive dredging programme should be made.

(9) Water supply should be examined everywhere, including (a) attention to reservoirs; (b) lock gates and sluices; (c) the extension of back-pumping; and (d) the use of additional existing supplies of water.

(10) Defective embankments should be strengthened.

(11) Anti-ice equipment needs supplementing; it might be useful to rule that ice over 3 inches thick be left alone and that the consequent delays be accepted.

(12) Regular consignees should be induced or persuaded to stock up early in the winter so that the occasional inevitable mid-winter delays can be borne without industrial dislocation or extravagant measures.

(13) A loading gauge (or gauges) should be laid down to prevent risky over-loading, with the attendant danger of a craft grounding and blocking the route for other traffic.

(14) Craft should be made subject to periodical tests for water-worthiness.

(15) The design of barges and propellers should be overhauled and controlled to secure general use of the best types.

(16) A complete review is required of canal wharves, quay spaces, handling appliances, service roads, repair yards, spares, docking facilities, and the extended use of pallets and containers.

(17) Such canal carrying organisations as have not come under direct national control should aim at the highest efficiency of service by association, research and mutual assistance, and should work out a uniform policy on such matters as: (a) conditions of carriage; (b) demurrage; (c) hours and conditions of work for watermen; and (d) training arrangements for new entrants to the industry.

(18) The appropriate Government Departments would do well to consider inducing appropriate industrial plants to locate themselves on the improved or existing waterways.

(19) There should be a general move towards the wide adoption of a 100-ton boat, minimum beam 17 feet, capable of taking standard, international cargo containers.

(20) The question of instituting a standard clearance for bridges, sewer crossings and flood control works should be re-examined.

END OF THE SERIES OF ARTICLES ON "PORT OPERATION."

(See Editorial announcement on page 56 with reference to re-issue in book form.)

Review

Silos and Grain Elevators in the Argentine Republic (" Granos y Elevadores en la Republica Argentina "), by Ernesto Schulte, Director General of Construction of Grain Elevators in the Argentine Ministry of Public Works; 414 pages, 46 half-tone illustrations, 19 plans and 543 drawings. Published by Talleres Graficos Emilio Fenner. Rossario, 1947 (in Spanish).

The author of this work has presented the results of a decade's experience of grain elevators in an attractive and comprehensive manner; it is an excellent progress report of every phase of activity in the design, construction and operation of the Argentine Government grain elevator programme which is intimately linked with the development of Argentine ports.

He gives some interesting statistics about his country and her grain trade. In 1914 the rural population was 3,300,000 and this has remained more or less stationary with a slight fall in recent years; in contrast, the urban population has increased from 4,500,000 in 1914 to 9,500,000 in 1938. In the period 1914-1940 the total population employed in industry has grown from 38.7 to 48.5 per cent., this increase having been gained at the expense of the agricultural industry in which the total number employed has decreased from 27.6 to 17.7 per cent. in the same period.

Argentine national economy is dependent upon the export of grain, proved by the fact that over the decade 1930-1939 the average annual value of grain exports represented some 53.8 per cent. of the export trade of the country. There are about 180,000 grain producers in Argentina, representing 3,000 commercial agencies and some 50 exporting firms selling grain to overseas buyers, but the greater proportion of grain exports is handled by four large international concerns; they deal in more than 80 per cent. of the wheat, and in more than 90 per cent. of other grain. They are Bunge & Born, Ltd., Louis Dreyfus & Co., Luis de Ridder, Ltd., and the La Plata Cereal Co. This concentration of the grain trade is also evident in other countries, but not to the same extent as in Argentina. In Canada there has been control and legislation of the grain trade for fifty years, but it is only recently that the provision of the necessary grain elevators has been undertaken in Argentina. The author gives an interesting table showing the average annual grain exports for the decade 1930-1939; these are 3,406,085 tons of wheat, 6,234,161 tons of maize and 1,536,027 tons of linseed. Exports to the United Kingdom represent 28.5, 36.3 and 9.3 per cent. of these totals respectively.

The importance of the grain export trade is further emphasised by the following table for the decade 1930-1939:—

Grain	Average Annual Production in tons	Average Annual Export in tons	Percentage of Grain Exported
Wheat ...	6,243,000	3,406,085	54.5
Maize ...	7,920,900	6,234,161	78.7
Linseed ...	1,710,700	1,536,027	89.8
Oats ...	841,100	444,618	52.9
Barley ...	536,500	300,884	56.1
Rye ...	204,700	124,917	61.0
Totals	17,456,900	12,046,692	69.0

Another extremely interesting table, which gives some clue to one aspect of the world food situation, shows that Argentina with a population of 12,000,000 has an average annual grain production of 1.439 tons per inhabitant; the corresponding figure for the whole of Russia, with a population of 168,500,000 is 0.439. For the United Kingdom the average annual production per inhabitant is 0.092 tons. These statistics apply to the period of eight years from 1930 to 1937. Argentina leads the world in grain production per inhabitant. In Canada the annual grain production is 15,643,900 tons and storage capacity is 10,325,500, whereas in Argentine the corresponding figures are 17,874,900 and 1,092,300 tons, representing a storage percentage of 6.1.

It is therefore not surprising that Argentina has a National Grain Silo and Elevator organisation—the terminal elevators at ports having exceptionally large capacity. For example, at the New Port of Buenos Aires the elevator has a capacity of 148,500 tons; the grain handling building is in the centre of the plant, flanked by the storage silos. A complete hydraulic dust separating plant is installed. Total capacity of all the terminal elevators is 529,100 tons and of the provincial elevators 348,100 tons. The British firm of Henry Simon, Ltd., Stockport, who are specialists in grain handling and elevating equipment, have been responsible for the complete electrical and mechanical plant for the elevator at Quequén, Rosario Sud, Villa Constitución, and Ingeniero White, with capacities of 47,600, 76,000, 54,000 and 61,600 tons respectively.

The author gives an interesting historical review of grain storage, stating that the granaries of ancient Egypt date back to 2,200 years before Christ, believed to have been built of beaten clay and bricks; Joseph, faced with the problem of adjusting seven good harvests with seven poor ones, built 36 granaries of this type in 1,700 B.C. Chinese granaries date back 2,000 years before Christ; they were large structures built by the State, in which was stored the excess production of bumper crops to supplement subsequent poor harvests.

Reinforced concrete has replaced all other materials for the construction of grain silos, and the author devotes a chapter to the evolution of a system of sliding shuttering by means of which it has been possible greatly to accelerate speed of construction. The author himself has taken out a British patent (No. 558,225) for a device which he claims has shown marked speed and economy over other methods; he uses a number of screw jacks disposed around the circumference of the silo, in conjunction with a specially designed bearing block. This enables the supporting rods to be drawn upwards as the work proceeds, and none of them is built into the concrete wall; this effects an important saving of steel.

An interesting chapter is that dealing with pneumatic transport of grain, a method highly developed in Europe, particularly at the Ports of Hamburg and Antwerp. This system is employed at the terminal elevator of Buenos Aires, in which two mobile installations are used, each with a suction capacity of 50 tons per hour. Grain is delivered to this elevator by railway waggons, by lorries and by river transport. The equipment is mounted on a framework running on rails, with space beneath to accommodate railway trucks; there are three floors above this carrying the machinery. On the upper floor are mounted two cranes for handling the grain suction pipes which are lowered into the hold of a vessel discharging grain. Dust extraction apparatus is fitted on the equipment. These two mobile grain handling plants are linked to the elevator by a belt conveying system.

The problem of dust extraction also has received careful study by the author. He states that dust should be removed not only for reasons of health, but also on the grounds of safety, because disastrous explosions in grain silos have occurred in Canada, the U.S.A. and Argentina, an example in the latter country having occurred at Rosario. He writes that for a long time there was no reasonable explanation for these explosions, but the modern view is that electricity is the cause. It is well known that electricity is generated by friction between two bodies, and that sudden separation causes a spark of high potential which will act as a trigger and initiate an explosion in the dust within the hot confined space of the silo; efficient elimination of dust is therefore essential, accompanied by continuous change of air within the storage plant.

In conclusion, the author points out that his country has already suffered heavy loss owing to lack of grain storage facilities. He stresses the need for grain throughout the world, which will increase with increased population and with higher standards of living. Maximum possible planning of grain storage throughout the world is essential in his opinion, and he backs this contention by cogent arguments and a fine literary style, supported by a wealth of detail on every phase of grain elevator design, construction and operation which must be of great interest and value to engineers and port authorities throughout the world. This book is indeed a useful work on an extremely important subject and it is hoped that some day it will be translated and published in English.

British Standards Institution.

The Annual General Meeting of the British Standards Institution will be held on Wednesday, 21st July, 1948, at 3 p.m. at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2.

The United Kingdom Pilots' Association

Resolutions Passed at Annual Conference

The 61st Conference of the United Kingdom Pilots' Association was held in London early last month, with Mr. Alexander A. Love, of Glasgow, senior vice-president, in the chair. Many points of interest were debated and a number of resolutions were approved and adopted.

Presenting his Report, Sir John Inskip, the Secretary and Solicitor of the Association, said that the membership was a little higher than a year ago, notwithstanding the loss of about 75 Tyne pilots whose ranks were now unfortunately divided between the Association and the Transport and General Workers' Union. Recently there had been signs of a desire on the part of some of the ports which had seceded to return to the Association and so enable the pilots to present a united front, and there had been direct approaches to him by individual pilots at certain of the ports in an attempt to pave the way for their return. It had, he thought, been brought home to almost every pilot that however powerful a body might be, if the great bulk of its members were in occupations which had absolutely nothing in common with pilots, such an organisation must of necessity find it very difficult to represent a small number of specialised and professional men whose legitimate interest must sometimes conflict seriously with those of other persons.

The Problem of Pilotage Rates

Dealing with the question of pilotage rates, Sir John said that in response to a request from the Ministry of Transport for some alternative to the present position, No. 1 of the Seven Points Policy of 1933 was revived and submitted to the Ministry for serious consideration as a preliminary step. Admittedly, the adoption of that proposal would still leave the problem of the yardstick, upon which the Ministry insisted, unsolved, but it would simplify matters. The point was worded as follows:—

" That every ship entering or leaving a port and having the right to demand the services of a pilot shall be required to make a contribution to a fund to cover the administration of the pilotage service and the maintenance and upkeep of the cutter service."

The essence of the proposal was that the compulsory levy falling upon every ship claiming the right to use the pilotage service should cover every expense except the remuneration of the pilots, and that no part of it should go to make up the pilots' remuneration, which would be provided by the ships which employed the pilot. At present the burden was borne in the main by those ships which employed a pilot regularly either by compulsion or as a voluntary service, and it was fair neither to the shipowner nor to the pilot to rely on the number of ships piloted as an indication of the work for which a pilot was remunerated.

Antiquated schedules of rates were in force at many ports, and there were cases in which the basic footage rates went back more than 40 years. A footage rate which might have been a reasonable one 30 years or more ago was altogether unfair and unreasonable to-day. An antiquated tonnage rate did not operate so unfairly, but there were many ports whose basic tonnage rate must have been fixed before the war of 1914-18. There could be no justification for tying pilots down to conditions of working which had been tolerated far too long and to pre-war rates of pay, subject only to an increase which was granted to civil servants under completely different conditions. Not only had they got obsolete tariffs, but many ports were suffering under a system of preferential rates. Again, too many ports were still suffering from the fact that their earnings had been allowed to remain at an absurdly low level before the reorganisation of pilotage following the report of the Department Committee in 1911. The cost of pilotage to the shipowners calculated on a tonnage basis showed smaller proportionate increase over the past 30 to 40 years than any other of their costs, and pilotage was from their point of view the cheapest service they enjoyed.

Sir John then briefly referred to the position of pilots under the National Insurance Scheme, and to the proposal by the Mercantile Marine Service Association for payment to certificated officers for pilotage services and finally mentioned the matter of Ration Book 6 (Modified) for pilots. With regard to the last named, he said that although dock pilots, crews of tug boats working in and round the docks, dredger crews and others, had had their claims admitted, the claims of licensed sea pilots had been rejected.

Mr. D. J. Davies (Swansea), who opened the debate on the report, said that pilots' earnings to-day were inadequate and there was no comparison with the improved conditions prevailing in other professions.

On the question of the future policy of the Association, Mr. E. Holmes (Humber), said that in his opinion, though the Pilotage Act was out of date it contained many safeguards.

Mr. M. M. Marshall (Tyne), suggested that the Association should press for general compulsory pilotage, and thought the majority of the non-compulsory ports were in favour of that step.

Mr. D. H. Tate (Middlesbrough), pointed out that one of the main difficulties in securing uniform agreement among pilots in regard to future policy was that conditions differed in almost every port in the country, and Mr. H. A. Burton (Middlesbrough) said that the setting up of a Departmental Committee to enquire into pilotage generally was the only solution.

The report was approved and adopted.

Resolutions Adopted

A resolution proposed by Mr. H. J. Wynn (Gravesend River), and seconded by Mr. H. G. Pead (Cardiff), was carried, endorsing the action of the executive committee in opposing the proposal of the Mercantile Marine Service Association for payment to masters and mates for pilotage services. Such a state of affairs, it was contended would be harmful to pilots.

A resolution proposed by Mr. K. Hutchings (Isle of Wight Inward) and seconded by Mr. A. M. Thompson (Isle of Wight Inward) " That this Association take steps to expedite direct contact as between the Ministry of Transport and other interested parties (including representatives from the district) when district applications are under consideration," was then carried unanimously.

Two resolutions, one from Swansea on the inadequacy of pilots' earnings, and another from Falmouth calling for the establishment of a 60% increase on the 1936-38 earnings as a minimum working basis for every port, were amalgamated with an item on the agenda dealing with pilotage rates and the Ministry of Transport formula, and after full discussion, the following resolution was drawn up and submitted to the conference:—

" That this Association continue to press the Ministry to call a meeting of all representative parties to discuss:—

(1) The formula; (2) Point 1 of the 7-Points Policy; (3) The desirability of a Departmental Committee, and (4) as an immediate step that a 60% increase on the 1936-38 earnings be established as a minimum working basis for every port."

This was proposed by Mr. D. J. Davies (Swansea), seconded by Mr. J. T. Watson (Falmouth), and carried unanimously.

Formation of Small Ports Committee

Another resolution, unanimously adopted was put forward by Mr. N. A. Line (Cinque Ports), a member of the Executive Committee, who moved:—

" That this Association would be strengthened, and the discussions of the Executive Committee facilitated, by the formation of a Small Ports Committee, representing ports with not more than ten pilots, working in the closest co-operation with the Executive Committee; and that the rules of the Association should be altered so as to reserve one place on the Executive Committee for a nominee of the small ports, such nominee to be elected annually by conference from not more than three nominations to be submitted by the Small Ports Committee."

This was an amendment to a resolution originally proposed by Mr. C. H. Chase (King's Lynn), who stressed that the resolution was only to strengthen the Association. Small ports had problems of their own which were not thoroughly understood by others, even the Executive Committee. If such a committee were formed, area problems could be discussed and policies formulated for the general guidance of the Association.

In the discussion that followed, Mr. B. C. Webb (Hon. Treasurer) said he supported the grievance of the small ports

United Kingdom Pilots' Association—continued

pilots that they could not get any representation on the Executive Committee, but he thought the plan would bristle with difficulties. The Executive Committee could not possibly be responsible for the liabilities or assets of an organisation of small ports pilots. Also as these men could not attend Executive Committee and annual conference meetings to submit their grievances and requirements because of the financial expense, he did not see how they could get together at a central meeting place for their own deliberations. He agreed, however, that a place should be found on the Executive Committee for a representative of the small ports.

Mr. P. A. Hawksworth (Portsmouth), said there was no suggestion of a separate association for pilots of small ports. If the proposal was likely to cause a split in the United Kingdom Pilots' Association, he was sure it would have no support.

Several delegates thought that the scattered geographical positions of the small ports would make meetings of the Small Ports Committee impracticable and after further discussion on all aspects of the proposal, Sir John Inskip said: " I am in favour of letting the small ports men try this. Even if they fail, the bottom will not fall out of this Association. Twenty-eight ports come within the scope of this motion and they have problems which many of their colleagues in the larger ports have no means of appreciating. A larger proportion of our American membership comes from pilots at the small ports than at the large ones. If the scheme is a failure, no doubt the small ports men will yield to abandoning it at the end of the year. But if it succeeds, they can be encouraged to go on, and it may well bring us many new members."

The conference also accepted another resolution, moved by Mr. J. Bennett (Barry), that each pilotage district be requested to formulate a working policy affecting their district for the future operation of pilotage administration, working conditions and earnings. By such action, Mr. Bennett said, they could formulate schemes in the various ports in advance of the new committee which the conference had just agreed to, and so have their cases ready for presentation.

Messrs. Love and F. R. E. Goldsmith (London Channel) were re-elected vice-presidents.

Mr. M. M. Marshall (South Shields), Mr. J. H. Innes (Glasgow) and Mr. H. B. Eagle (Isle of Wight Outward), retiring members of the Executive Committee, who offered themselves for re-election, were reappointed, and Mr. H. G. Pead (Cardiff) and Mr. H. J. Wynn (Gravesend River) were elected to the two vacancies which had occurred.

Correspondence

To the Editor of *The Dock and Harbour Authority*.

Dear Sir,

"The Future of British Ports and Canals".

I am instructed by my Board to refer to the above article which appeared on pages 11 and 12 of your publication for May 1948, and in connection therewith to call attention to the following points:—

1. The definition of a "trade harbour" under the Transport Act 1947 (Section 66 (1)) does not require the business of a general wharfinger to be engaged in or for there to be competition with other local ports. Therefore, all harbours in Great Britain other than those specifically excepted by the Section are entitled to be considered as trade harbours.

2. Section 70 of the Act premises the essential nature of coastal shipping particularly for facilitating the through carriage of goods. The smaller ports provide terminal points for this traffic, and for continental and certain classes of deep sea traffic, at strategic places for the industries they serve. Industries in general are disposed in localities because of the advantages of these localities and every industry is an integral part of our national economy. If a port is primarily concerned with a particular trade it is because the industry served by that trade requires it. Unless, therefore, it is proposed to close down the industry as well as the port serving it, the traffic will have to flow through other channels. The allocation of these traffics to fewer ports for transhipment to road or rail for final delivery can result in delay, congestion at the selected ports, increased costs and an added burden on road and rail transport.

3. Without presuming to argue the merits or demerits of grouping it is suggested that Mr. Flere's tentative grouping requires very careful investigation. So far as the Wash is concerned, he proposes to divide the Wash Ports between the Midland Area and the Eastern Area. During the recent hostilities the Wash Ports were treated as a unit and continue to be so treated for certain purposes e.g. dock labour. Experience has shown that this grouping is satisfactory.

4. Finally, it is pointed out that the preparation of schemes for any trade harbour or group of trade harbours is the sole prerogative of the Commisison (Sect. 66 (3)) and that any scheme, even if it is prepared by the Commission at the request of the Minister of Transport (Sect. 66 (9)), must be prepared in consultation with the local bodies or persons concerned.

Yours faithfully,
TOM A. VALENTINE.
General Manager & Clerk.

The King's Lynn Conservancy Board,
Norfolk. 20th June, 1948.

To the Editor of *The Dock and Harbour Authority*.

Dear Sir,

The Impact of a Vessel with a Pier.

I am grateful to Mr. Minikin for his letter in the June issue of *The Dock and Harbour Authority*, and particularly for his practical suggestion of using a plastic material to measure the instantaneous deflections of the fender.

As he says, it is possible that the rubber buffers during the tests were not always compressed uniformly and that the compression measured at the side of the bufler was not the mean value. The vessel striking the fender contacted a wrought iron rubbing strip on the face of the fender as was shown in Fig. 3. This five inch wide strip had a convex face, so that under the conditions of the test the load was applied centrally, its direction being practically normal to the fender face. Consequently it is likely that in general the buffers were compressed fairly uniformly, though I agree that for an accurate investigation it would be better to take measurements on the centre line of the buffer.

As I pointed out in my article, there is a decrepancy in the figures for the buffer loadings revealed by comparison of the level of their resultant with the level of impact, and I mentioned briefly possible explanations. Any figures for bending moments and bending moment stresses derived from these loadings must be regarded as tentative figures to be revised as soon as more accurately determined figures are available. In obtaining a calculated fibre stress in the jarrah of over 14 tons per sq. in., I imagine Mr. Minikin has not made any allowance for the effect of the W.I. rubbing strip spiked to the face of the fender. If this could be regarded as attached so securely that the iron and jarrah constituted a compound beam, the tensile stress in the jarrah would be reduced to about 8½ tons per sq. in. Spike fastenings are seldom perfectly secure, so one can only say that the rubbing strip would reduce in some measure the stresses in the jarrah. Another point is that the stresses under consideration are peak stresses, lasting only for a fraction of a second, and that values which would be crippling if prolonged do no damage if practically instantaneous.

The accuracy of the buffer loading measurements, the firmness of the fixing of the rubbing iron, and the duration of the blow, are all points obviously needing further investigation, and I share with Mr. Minikin the regret that it was not possible to carry out a fuller series of tests on this occasion.

Yours faithfully,
H. T. Horsfield, M.Sc. (Eng.), A.M.I.C.E.

Civil Engineer's Dept.,
British Railways (Eastern Region).
24th June, 1948.

Notes of the Month

Additional Severn Ferry to be Opened.

To relieve road congestion, a new ferry across the Severn is to be opened in about three months' time between Arlingham and Newnham, near Cinderford. Floating piers from U.S. Army equipment will be provided, and the service will be operated 18 hours a day. The maximum weight permitted to be carried will be 5 tons.

Shipping and Invisible Exports Inquiry.

The Chamber of Shipping of the United Kingdom and the Liverpool Steam Ship Owners' Association have agreed, at the request of the Government, to undertake an enquiry into the contribution of United Kingdom shipping to invisible exports. Inquiries of this kind were carried out before the war at the request of the President of the Board of Trade in respect of the years 1931 and 1936 and proved a very valuable source of information about the shipping contribution to the United Kingdom balance of payments.

Disposal of Mulberry Harbour Components.

In the House of Commons recently, the Minister of Supply, replying in a written answer to a suggestion for utilising Mulberry Harbour components in the Colonies, said that the only Mulberry Harbour was at Arromanches, where 100 concrete units forming the outer wall were still in position to protect salvage operations on the sunken ships. All the pierheads and floating roadways, together with a few redundant concrete units, had already been sold and increasing deterioration made it unlikely that any further concrete units would be available for disposal.

Port of London Appointment.

Mr. George A. Wilson, M. Eng., M.I.C.E., who was Superintending Civil Engineer in Ceylon and India during the years 1942-1945 for the Civil Engineer in Chief, Admiralty, has been appointed Deputy Chief Engineer to the Port of London Authority from the 1st August, 1948.

After serving a Mechanical Engineering Apprenticeship Mr. Wilson studied Civil Engineering at Liverpool University and then worked for the Anglo-Iranian Oil Company in Persia. Later he won the Charles Hawkesley Prize of the Institution of Civil Engineers, and has been engaged on harbour and marine construction works for the Admiralty for some 16 years.

New Bridge at Aberdeen Harbour.

Authority to proceed with the building of a new bridge over the south entrance to Aberdeen Harbour is again to be sought from the Ministry of Transport by Aberdeen Harbour Board. An application for permission was made some time ago, but the Ministry replied that, while justification for the scheme was appreciated, the amount of labour and materials available for the work was not at that time known, and suggested that the application be withheld until the end of the year. With the relaxation of restrictions on new applications for authorisation of works, the Ministry has now informed the Harbour Board that their application can again be submitted.

Floating Dock for Port of Abadan.

A floating dock, purchased from the Admiralty by the Anglo-Iranian Oil Company, Ltd., recently arrived at Abadan. The dock was built in 1924 at Lubeck, Germany, for a South American company, and was first located at Montevideo. During the war it was bought by the British Government and towed to Vizagapatam, for use with the Eastern Fleet. It is 396-ft. long and has an overall breadth of 82-ft. The lifting capacity is 5,000 tons and the equipment includes a 5-ton crane. The dock was towed from Vizagapatam to Abadan, a distance of 3,185 miles, by three of the company's tugs, taking 30 days to make the passage. It is to be used to enable the Company to undertake more extensive repairs to ships at Abadan than has been possible hitherto.

Floating Dock for Denmark.

A partly sunk and lightly damaged floating dock with a capacity of 7,000 tons, at present lying in the Port of Hamburg, has been handed over to the Danish Government by the occupying forces and is to be towed to the Aalborg Shipyard, Aalborg, by the Danish Svitzer Salvage Co., Copenhagen.

Development of Jarrow Slake

A standing joint committee of representatives of Jarrow and South Shields Corporations and the Tyne Improvement Commission is to be formed to discuss the development of the Jarrow Slake area. Conflicting proposals for using the site for deep water quays or for factories for the Bede Estate have been put forward, and the future of the area is uncertain.

Increased Trade at South Wales Ports.

In the first 24 weeks of this year the ports of Cardiff, Swansea, Newport, Barry, Port Talbot and Penarth, handled a total of 5,839,710 tons. This was 1,340,367 tons up on the corresponding period of 1947. Imports amounted to 2,345,897 tons against 1,704,760 tons and exports 3,493,813 tons against 2,794,583 tons. The number of ships that used the ports rose from 6,417 of 3,843,192 tons net, to 6,922, of 4,246,541 tons net.

Antwerp Oil Harbour Installation.

It was recently announced that plans for the establishment of a second oil harbour in the Port of Antwerp have reached an advanced stage. The present oil harbour, which can no longer handle all Belgium's fuel requirements, is situated near Hoboken on the Scheldt. The projected new harbour will be built north of it, in the direction of the Kruisschans sluice. Its construction will be undertaken by a private company who will work in co-operation with the Antwerp port authorities and the Belgian Government.